AD-A118 237 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 6/5

UNITED STATES NAVY FLEET HOSPITAL SUPPORT: EVOLUTION, ORGANIZAT--ETC(U)

MAR 82 G L RUPP, J K SELFE

UNCLASSIFIED NL

1 OF 1

AD A118237

END

DATE FILMED

9 82

DTIC

# NAVAL POSTGRADUATE SCHOOL
## Monterey, California







# THESIS

UNITED STATES NAVY FLEET HOSPITAL SUPPORT:
EVOLUTION, ORGANIZATION, AND DEVELOPMENT

by

Gary L. Rupp
and
John K. Selfe

March 1982

Thesis Advisor: John W. Creighton

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER | 2. GOVT ACCESSION NO. AD-A118237 | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle) United States Navy Fleet Hospital Support: Evolution, Organization and Development | | 5. TYPE OF REPORT & PERIOD COVERED Masters Thesis March 1982 |
| | | 6. PERFORMING ORG. REPORT NUMBER |
| 7. AUTHOR(s) Gary L. Rupp John K. Selfe | | 8. CONTRACT OR GRANT NUMBER(s) |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93940 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93940 | | 12. REPORT DATE March 1982 |
| | | 13. NUMBER OF PAGES 89 |
| 14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) | | 15. SECURITY CLASS. (of this report) |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Fleet Hospitals, Fleet Hospital Support System, Fleet Hospital Support Office, Bureau of Medicine and Surgery, Casualty Flow, Alternatives to Dedicated Hospital Ships, International Standardization Organization.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This paper examines the evolution of the U. S. Navy's Fleet Hospital Support System. Various agencies and bureaus within the Department of the Navy have been attempting to design a suitable, deployable combat hospital system. Each agency involved with the problem has produced varying designs for a feasible system. This paper integrates the various design proposals into one document for purposes of planning, comparison and coordination. It analyzes the current status of the

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Fleet Hospital Program and discusses methods that can be utilized by the planners of the system to enhance program review and development progress. The paper concludes with recommendations concerning methods for attaining resolution of the problems in designing and implementing a suitable Fleet Hospital configuration.

Approved for public release; distribution unlimited.

# United States Navy Fleet Hospital Support: Evolution, Organization, and Development

by

Gary L. Rupp
Lieutenant, Medical Service Corps, United States Navy
B.A., Chapman College, 1979

and

John K. Selfe
Major, Transportation Corps, United States Army
B.S., Saint Leo's College, 1976

Submitted in partial fulfillment of the
requirements for the degree of

*MASTER OF SCIENCE IN MANAGEMENT*

from the

NAVAL POSTGRADUATE SCHOOL
March 1982

Author: Gary L. Rupp

John K. Selfe

Approved by: John W. Creighton, Thesis Advisor

Richard E. Elster, Second Reader

Chairman, Department of Administrative Sciences

W M Woods, Dean of Information and Policy Sciences

ABSTRACT

This paper examines the evolution of the U. S. Navy's Fleet Hospital Support System. Various agencies and bureaus within the Department of the Navy have been attempting to design a suitable, deployable combat hospital system. Each agency involved with the problem has produced varying designs for a feasible system. This paper integrates the various design proposals into one document for purposes of planning, comparison and coordination. It analyzes the current status of the Fleet Hospital Program and discusses methods that can be utilized by the planners of the system to enhance program review and development progress. The paper concludes with recommendations concerning methods for attaining resolution of the problems in designing and implementing a suitable Fleet Hospital configuration.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

## TABLE OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ABFC | Advanced Based Functional Component System |
| ADHOS | Alternatives to Dedicated Hospital Ships |
| AMT | Acquisition Management Team |
| AMIS | American Standards Institute |
| ATF | Amphibious Task Force |
| BUMED | Bureau of Medicine and Surgery |
| CESE | Civil Engineering Support Equipment |
| CESO | Civil Engineering Support Office |
| CNET | Chief, Naval Education and Training |
| CNO | Chief of Naval Operations |
| COMMZ | Communication Zone |
| CONUS | Continental United States |
| COSBAL | Coordinated Shorebased Allowance List |
| DCF | Definitive Care Facility |
| DNBI | Disease/Non-Battle Injury |
| DOD | Department of Defense |
| DTS | Defense Transportation System |
| FHP | Fleet Hospital Program |
| FMF | Fleet Marine Force |
| FSHO | Fleet Hospital Support Office |
| HEPA | Hospital Environment Filtering Apparatus |
| Hz | Hertz |
| ILSMP | Integrated Logistics Support Management Plan |

| | |
|---|---|
| ISO | International Standardization Organization |
| JCS | Joint Chiefs of Staff |
| LCC | Life-Cycle Cost Plan |
| LOC | Line of Communication |
| MATH | Modular Air Transportable Hospital |
| MCEMS | Marine Corps Environment-Control Medical Systems |
| MCESS | Marine Corps Expeditionary Shelter System |
| MIS | Management Information System |
| MUST | Medical Unit Self-Contained Transportable |
| NAVFAC | Naval Facilities and Engineering Command |
| NAVSUP | Naval Supply Systems Command |
| NCF | Naval Construction Force |
| NDCP | Navy Decision Coordinating Paper |
| NHSETC | Navy Health Science Education and Training Command |
| NSF | Navy Stock Fund |
| OM&N | Operation and Maintenance Navy |
| OMR | Output Methods Resources |
| OPLANS | Operation Plans |
| OPN | Other Procurement Navy |
| OPNAV | Office of the Chief of Naval Operations |
| PHST | Packaging, Handling, Storage, and Transportation |
| PWRMR | Prepositioned Reserve Material Requirements |
| RPCS | Relocatable Panelized Complexible Shelters |
| SE | Support Equipment |
| SPCC | Ships Parts Control Center |

| | |
|---|---|
| TEMPER | Tent Extendable Modular Personnel |
| TLD | Technical Logistic Data |
| TYCOMS | Type Commanders |
| UIC | Unit Identification Code |
| WIA | Wounded in Action |

# I. INTRODUCTION

## A. BACKGROUND

Mercurial fluctuations in the relationships between major world powers, and events of military or quasi-military actions such as those in Iran, Afghanistan, and most recently Poland have increased the nation's civilian and military leaders' interest in the state of combat readiness of the U. S. Armed Forces. A vital part of the overall state of combat readiness is combat medical readiness.

The wartime medical readiness mission is assigned directly to the Department of Defense (DOD) by law (10 U.S.C. 3062, 5012, and 8062). DOD regulations unambiguously transmit that mission to the Medical Departments of the Army, Air Force, and Navy. Over the past few years there has been an increasing concern within Congress, DOD, and the services' medical departments about the capability of the U. S. Military to deliver adequate combat medical care. [Ref. 1]

At the 88th Convention of the Association of Military Surgeons of the U. S. in November 1981, Doctor John H. Moxley III, Secretary of Defense for Health Affairs during the Carter administration, stated:

> "The harsh reality is that if the United States commits forces to major combat...we could not care for a significant portion of our casualties. We do not have enough deployable hospitals of any kind to provide even the emergency surgical treatment required to prepare the predicted numbers for evacuation. Our current lack of assets puts us in a most awkward position. In the face of an enemy challenge, we would have to either forego defense of our national interests or commit our servicemen to combat without the medical support we have been able and willing to provide in every American war in history." [Ref.2]

Each military service must define, or arrange for the definition of, the medical requirements for its individual service. This function for the Navy has been given to the Bureau of Medicine and Surgery (BUMED), which is specifically accountable for supplying adequate medical and health care for Naval personnel. In addition, in times of crisis BUMED is responsible for proper hospitalization and medical evacuation of not only Navy personnel but Marine Corps personnel as well. [Ref. 3]

The violence of the modern battlefield, with its ultrasophisticated weapons, will produce large numbers of casualties in a very short time. [Ref.4] DOD and the Navy Medical Department have taken various steps to ensure medical care for the expected high numbers of casualties in a future contingency. These include: (1) the Pentagon's enlisting as many civilian hospitals as possible in the vicinity of existing military hospitals and within relatively short distances from air bases into which casualties would be flown from abroad and setting aside bed space for the casualties; (2) pursuing increased resource sharing within DOD and with the Veterans Administration; (3) the Navy's increasing direct care productivity with the transfer of physicians from administrative positions to direct patient care; (4) placing increased emphasis on ensuring that the health care professionals, from physicians to corpsmen, receive adequate training to prepare them for their wartime roles; and (5) including developing of improved methods of preventing and treating casualties in research and development goals. This last step includes the development and testing of the Fleet Hospital Support concept. [Ref.5]

## B. PURPOSE

Various agencies and bureaus within the Department of the Navy have been attempting to design a suitable, deployable, Fleet Hospital Support System. Each agency or bureau grappling with the problem has produced varying ideas and schemes for a feasible system. However, the varying plans have not been incorporated into one summary document for purposes of comparison, planning and coordination.

It is the purpose of this paper to: (1) Integrate the various design proposals for the Fleet Hospital Support System into one document; (2) Present an analysis of the current status of the Fleet Hospital Support System's development and implementation program; and (3) Present recommendations for resolution of current and potential problems in the progress of the Fleet Hospital Support System's development.

## C. OVERVIEW

As originally envisioned, Fleet Hospitals are to be self-contained, relocatable, and easily transported and erected. When prepositioned in strategic communications zones (COMMZ) within the theater of operations or set up in the rear combat zone, these facilities are to provide immediate, maximum response in support of combat operations by receiving casualties from Marine Corps organic medical elements in the combat zone, or from initial casualty-receiving ships of the amphibious task force--LHA's, LPD's, LPH's--or from hospital ships operating in the area.

The Department of the Navy conducted two primary Fleet Hospital Support System studies. A review of the relationship of these studies in Chapter II includes the Fleet Hospital Management Program that was established and the program's key logistical considerations.

The key determinant in the Fleet Hospital Support (FHS) requirements is the anticipated type of casualty, severity of casualty injury/illness, and casualty flow. The method used by both Fleet Hospital Support study groups to generate the anticipated casualty mix is discussed in Chapter III.

Transportable hospital systems being used by the other armed services, and commercial shipping containers that could be modified were considered for adoption, both separately and in various combinations. Chapter IV is a summarization of the primary configurations that BUMED considered and the key characteristics of each of these configurations.

The analysis of the various transportable hospital platforms resulted in the selection of a combination system for modification, test and evaluation. This combination system, and the reasons for its selection, are presented in Chapter V, along with the rationale presented by the Fleet Hospital Support System planners for non-selection of the other hospital configurations.

The Fleet Hospital test and evaluation process has disclosed several critical problem areas that are hampering the implementation of the Fleet Hospital Support System. Chapter VI highlights the problems currently encumbering the Fleet Hospital Program, as well as problems that can be reasonably expected in the future.

This paper concludes with the authors' recommendations for resolving the pivotal problems the Fleet Hospital Program has encountered, or will encounter in the later stages of the Fleet Hospital Support Program.

## D. RESEARCH METHODOLOGY

This research effort consisted of two separate approaches: (1) A search was conducted to survey DOD reports, instructions, management

guides, and policy statements that were relevant to the topic; and (2) A number of on-site visits were made to the Fleet Hospital Support Office (FHSO) in Alameda, California, and to other pertinent agencies/ facilities to acquaint the authors with the Fleet Hospital Support program and to enable them to conduct interviews with people connected with the operation.

## II. THE FLEET HOSPITAL MANAGEMENT AND LOGISTICS PROGRAM

The Fleet Hospital Program (FHP) concept posed come unique operational challenges for the Navy. It was recognized at the outset that such an extensive project would require intensive planning, followed by close and continual coordination of many separate offices. BUMED also recognized the Logistics portion of the FHP would present the most critical problems. (The ultimate success of the Fleet Hospital hinges on the ability to get it to the contingency COMMZ, erected, and operational in a very short time frame. This is clearly not the function of medical personnel for the most part.)

An Integrated Logistics Support Management Plan (ILSMP) was developed and published to outline the various responsibilities and interfaces. The ILSMP was intended to be dynamic and flexible, changing as the FMP went through the process of program evolution. The following paragraphs are summarized from the October 1980 revised draft ILSMP.

### A. PROGRAM MANAGEMENT

Management of the Fleet Hospital Support Program at the CNO (Chief of Naval Operations) level was vested in OPNAV 41, Material Division, and

was to be coordinated by OP41H. The FHSO was given responsibility for the execution of the program as well as the necessary coordination between the staffs of the Office of the Chief of Naval Operations (OPNAV), BUMED, Naval Facilities Engineering Command (NAVFAC), Naval Supply Systems Command (NAVSUP), the Commanders-in-Chief (CINC), and the Type Commanders (TYCOMS) to attain the program objectives. Responsibilities for specific elements of the Fleet Hospital Support Program were designated as follows:

| | |
|---|---|
| Logistics Manager | FHSO |
| Facility Design | NAVFAC |
| Facilities | NAVFAC |
| Medical Equipment | BUMED |
| Support Equipment | FHSO |
| Packaging, Handling, Storage and Transportation | FHSO |
| Supply | NAVSUP |
| Provisioning | BUMED/NAVSUP |
| Personnel | BUMED |
| Training | BUMED/NAVFAC |
| Test and Evaluation | FHSO |
| Maintenance | FHSO |
| Technical Data | BUMED/NAVFAC |
| Funding | OPNAV 41C |
| Inventory Management | FHSO |
| Acquisition Management | FHSO |

There was also an extensive list of Navy Medical Consultants generated to assist in the selection of items comprising the Fleet Hospital tables of allowance.

## B. MAINTENANCE

Plans were required for the development of corrective or preventive maintenance procedures for the Fleet Hospitals during construction, relocation, preposition, and operational phases. Fleet Hospital maintenance was to be conducted at the operational/organizational level.

### 1. Operational Maintenance

NAVFAC was charged with developing and documenting procedures for facilities maintenance. These procedures were to be included in the hospital library of repair manuals. Supervision of the maintenance functions rests with those normally responsible in accordance with standard Navy hospital procedures, unless determined otherwise by BUMED.

### 2. Preposition Maintenance

BUMED was made responsible for preventive and corrective maintenance of all medical equipment, and the hospital in its sustained storage mode. Plans were to address equipment repair procedures, equipment monitoring, recordkeeping, asset rotation, and any other appropriate topic. Applicable inventory managers were to ensure documentation and procedures for their specific equipment. While BUMED, NAVFAC, and NAVSUP were given responsibilities in this area, it was intended more to the development of the actual plans and procedures, with FHSO the responsible agent for implementation while assets were in the sustained storage mode.

## C. SUPPLY

The supply plan referred to spares and repair parts needed for maintenance, replacement, and repair of Fleet Hospital medical, facility, support and transportation equipment. It also included repair parts for

Support Equipment. One of the purposes of this plan was to present the resources and direction necessary to provide adequate supplies of repair/spare parts, both repairable and consumable, for construction, storage, relocation and operation.

The Navy-wide, three-level (organizational, intermediate, and depot) maintenance concept was to remain in effect, ensuring repair parts were positioned at each designated maintenance level, with the Fleet Hospitals being authorized only organizational level parts.

The following supply organization functional responsibilities were assigned:

| | |
|---|---|
| Program Manager | FHSO |
| Supply Procedures | NAVSUP |
| Facility Supply Requirements | NAVFAC |
| Medical Supply Requirements | BUMED |
| Theater Supply | Theater Cdr/NAVSUP |

Plans were to include provisions for initial, follow-on and subsequent procurement/utilization of end items. Defense Logistic Support Center screening was directed to gain DOD-wide visibility of the assets. Consideration was to be given to procuring spares/repair parts with major end items to take advantage of quantity discounts and minimize contract modifications. FHSO was to pay particular attention to funding. Past experience indicated repair parts funding had been less than adequate to meet the demands of other programs. The long lead time necessary for some items was highlighted as a potential problem area.

## D. SUPPORT EQUIPMENT (SE)

SE is equipment required to make an item, system, or facility operational in its intended environment, and includes all equipment necessary to maintain, operate, calibrate or test. But this does not include built-in test equipment integral to the system, item, or facility, or environmental control equipment.

FHSO was given responsibility for overall management of this portion of the program, and was required to coordinate the efforts of BUMED, NAVFAC, and NAVSUP to develop, design, and integrate the SE into the facilities. Part of this responsibility included establishing the table of allowances concurrently with those of the medical and facilities equipment lists.

## E. PERSONNEL

BUMED and NAVFAC were given joint responsibility for the development of medical and consultant personnel requirements and plans. They used the MEDCON II model modified to account for support services, facility configuration, and expected resource availability. The staffing figures provided in Table 1 represent a range of medical/surgical capability for the minimal 250-bed Fleet Hospital through the maximum 1,000-bed Fleet Hospital. The Fleet Hospital is designed to operate under a variety of conditions, including fluctuating admission rates. The MEDCON II model (Medical Contingency Planning Model Phase II) accounts for this in the different scenario modifications. BUMED was tasked to develop the complete staffing, including progressive staff mobilization, ranks and specialty codes. [Ref.6]

TABLE 1

Staffing Requirements for Fleet Hospitals

| Staff Source | Staff Required Based on Number of Hospital Beds | | | |
|---|---|---|---|---|
| | 250 | 500 | 750 | 1,000 |
| Medical Corps | 45 | 70 | 91 | 116 |
| Dental Corps | 4 | 5 | 6 | 7 |
| Nurse Corps | 81 | 146 | 215 | 284 |
| Medical Service Corps | 26 | 33 | 53 | 57 |
| JAG Corps | 1 | 2 | 2 | 3 |
| Chaplain Corps | 2 | 2 | 4 | 3 |
| Civil Engineering Corps | 1 | 2 | 2 | 3 |
| Enlisted Ratings* | | | | |
| HM | 283 | 458 | 644 | 824 |
| Sea Bee (Occupational Field 13) | 99 | 136 | 168 | 178 |
| MA, BM, GM, SH | 269 | 331 | 418 | 496 |
| TOTAL | 812 | 185 | 603 | 1,971 |

* 25% will be senior enlisted rates.

There was also a requirement to plan for the personnel to maintain the hospital while in its storage mode at the prepositioned site. If these personnel were to be civilian/contract personnel, they would require the same relative skills/grades as military personnel. If they were to be military, they could also serve as part of the core construction element, and provide liaison between the medical elements and the construction battalion or unit that erects the hospital. These personnel requirements are shown in Table 2.

It was planned that the prepositioned maintenance crew would begin initial implementation of the break-out phase on notice of mobilization. Upon arrival of a Naval Construction Force, the prepositioned crew would revert to the liaison role until arrival of the Commanding Officer of the hospital and advance party. The Advance Party Hospital Staff would include personnel as follows:

Commanding Officer
Director, Administrative Services
Supply Officer (OIC, Preposition Maintenance Unit)
Public Works Officer
Operating Management Officer
Oral Surgeons
General Surgeons
Thoracic Surgeons
Radiologists
Anesthesiologists
Neurosurgeons

TABLE 2

Prepositioned Hospital Maintenance Detachment Personnel Requirements

| Personnel | | Staff Required Based on Number of Hospital Beds 250 | 500 | 750 | 1,000 |
|---|---|---|---|---|---|
| Officers: | LT MSC | 1 | 1 | 1 | 1 |
| Enlisted: | HMCM | 1 | 1 | 1 | 1 |
| | BMET-7 | | 2 | 2 | 3 |
| | BMET-6 | 2 | 2 | 3 | 3 |
| | OR TECH-5 | 1 | 1 | 1 | 1 |
| | LAB TECH-7 | 1 | 1 | 2 | 2 |
| | SK1 | 1 | 1 | 1 | 1 |
| | CEC | 1 | 1 | 1 | 1 |
| | CE1 | | | 1 | 1 |
| | CE2 | | | 2 | 2 |
| | CE3 | 1 | 2 | | |
| | CMC | 1 | 1 | 1 | 1 |
| | CM2 | | | 2 | 2 |
| | CM3 | 1 | 2 | | |
| | UT1 | | | 1 | 1 |
| | UT2 | | | 1 | 1 |
| | UT3 | 1 | 2 | | |
| Civilian: | Laborers | 3 | 6 | 8 | 8 |
| | Clerk-Typist | 1 | 1 | 1 | 1 |
| | TOTAL: | | | | |
| | Officers | 1 | 1 | 1 | 1 |
| | Enlisted | 11 | 16 | 19 | 20 |
| | Civilians | 4 | 7 | 9 | 9 |

Opthalmologists

Chief Nurse

Operating Room Nurses

Anesthesiology Nurses

Pathologist

Enlisted Personnel

Maintenance Personnel

NAVFAC was charged with identifying construction personnel to erect the hospitals and the personnel required on the hospital staffs for facilities operations and maintenance. CNO, Fleet CINC's, and BUMED were to designate the activities and personnel who would provide the construction and operational capabilities.

Since most of the military medical personnel trained for combat medicine are assigned to Continental United States (CONUS) medical facilities, initial staffing was to be planned using a draw-down of these facilities, followed by immediate deployment. This placed BUMED in the position of redesigning contingency medical mobilization plans in finite detail.

The skills and knowledge required to construct, relocate, operate, and maintain a Fleet Hospital are within the scope of existing ratings, so there is not a requirement to revise qualifications.

## F. TRAINING

### 1. Medical Procedures

The medical staff consists of those personnel directly providing patient care. These personnel were to be selected from BUMED activities

and indoctrinated into their mobilization role. No specialized training was considered necessary beyond this, except for a few designated specialties. BUMED would coordinate the information on current combat operating environments with Navy Health Science Education and Training Commands (NHSETC), who would ensure combat medicine training programs remain consistent with the proposed scenario(s).

2. Maintenance Personnel

BUMED was required to ensure appropriate training courses/manuals are developed to instruct biomedical engineers in the maintenance of medical equipment of Fleet Hospitals, in both the operational and sustained storage modes. NAVFAC was to perform the same function for facilities maintenance.

3. Hospital Construction/Operations

For the majority of the personnel, it was anticipated hospital construction/operation training would consist of an indoctrination in the Fleet Hospital concept and their particular role in the event of mobilization. Such an indoctrination program was to be provided each command for inclusion as part of the in-service training program.

A core of advance party personnel were to receive special hands-on training structured by BUMED. This would include training in all aspects of erection, operation, and maintenance of the hospital. Each of the several hospitals would be represented with different core parties.

## G. TECHNICAL LOGISTIC DATA (TLD)

TLD relates to the preparation of technical documentation necessary to install, maintain, and operate the shelter components and medical/

non-medical equipment that comprise a Fleet Hospital. It does not address provisioning technical documentation or medical procedures.

1. <u>Facilities and Non-medical Equipment</u>

When a Fleet Hospital is in operation, the technical manuals or other data pertaining to the maintenance and use of facilities components, utilities hardware, and other non-medical equipment will be controlled by the Shops Branch of the Public Works Service section. NAVFAC was made responsible for determining the need for manuals covering this subject, but each applicable inventory manager would develop the manuals not related to facilities components or utilities hardware.

2. <u>Storage Support Equipment</u>

NAVSUP was to develop procedures for the prepositioning, to include the provision of support equipment necessary to maintain and monitor a specified degree of environmental control. This also entailed ensuring the technical manuals were developed for operating and maintaining such support equipment.

3. <u>Medical Equipment</u>

When in the operational mode, the Medical Equipment Maintenance and Repair Branch will control technical manuals or other data relating to the maintenance and use of all medical equipment within the Fleet Hospital. BUMED was to be responsible for determining the need for any such manuals related to medical equipment.

## H. FACILITIES

The operational concepts and overall design requirements were to come from BUMED. NAVFAC was to provide the detailed design development and

facilities configuration efforts, including facility and Civil Engineering Support Equipment (CESE) procurement and assembly sepcifications.

1. Facility Configuration

NAVFAC is developing the overall hospital configuration on a functional basis to meet the operational concepts and medical requirements of BUMED. The functions to be provided and the patient flow/configurations are subject to change based on Test and Evaluation results. While each hospital may be individually configured for its scenario, a type-configuration will be used for core requirements.

2. Specific Shelter Selection

BUMED established the program objectives and defined the scope of design for definitive care, self-contained, transportable, rapidly erectable medical and base support facilities. The design effort was done by NAVFAC, which initially included identifying recommended transportable hospital shelters, supporting facilities, transportation equipment, utilities, a site plan, and a budget estimation. They subsequently contacted over 50 building and shelter manufacturers to evaluate products already on the market or in development. From this intensive search, NAVFAC selected the principal recommended shelters to be tested. They were:

ISO 7:1, 3:1, 2:1 expandable shelter/containers

ISO rigid, complexible container/shelters

Knockdown portable complexible shelters

M-75 tent designed by the Army

Passageways between shelters

The initial design configuration concentrated on the core area of the hospital, the area corresponding to essential medical functions, excluding non-intensive/recovery care.

3. Shelter/Equipment Interface

Each shelter in the Fleet Hospital has to be compatible with the construction and transportation handling equipment, supporting utility hardware, and the medical equipment to be utilized in the shelter. NAVFAC was held responsible for handling equipment and utility hardware constraints, BUMED for ensuring compatibility with corresponding medical equipment and procedures. BUMED was made final authority for all interior design and shelter configurations for operational/medical requirements.

4. Construction/Dismantling Procedures

BUMED medical equipment specialists were to develop and document the procedures for assembling and positioning the facilities, connecting the utility hardware, and unpacking and assembling the interior medical equipment. These procedures would be evaluated during the Test and Evaluation phases of the FHP. FHSO was responsible for identifying facility requirements to install the hospital in its sustained storage site at forward deployment locations. FHSO would then notify the responsible Fleet CINC and assist in the initiation of additional construction projects when necessary. NAVFAC would also assist in planning and constructing in these instances.

I. PACKAGING, HANDLING, STORAGE, AND TRANSPORTATION (PHST)

PHST are the functions that determine the relocatability, erection time, and operational readiness of the Fleet Hospital. Maximum use of

intermodal ISO containers with contents grouped according to hospital functions is viewed as the key to success of the total concept. The containers, after expansion, serve as operating rooms and other spaces necessary for definitive health care.

1. Packaging

It was directed that the Fleet Hospital would be packaged to the maximum extent possible in multi-purpose ISO-configured containers to reduce the need for normal packaging materials, minimize the gross weight of containers plus contents, minimize the number of personnel, amount of time, and skills required to ship, store, and erect the hospital.

FHSO would determine maximum gross weights for helicopter transportability. NAVSUP would develop the procedures manuals for storage and transportation, which were to include equipment/supplies location, loading plans for each container, weights, cubes, and all information needed by construction, maintenance, and hospital personnel to efficiently transport, store, and relocate the hospital. Determination of package design trade-offs, levels of protection, packaging costs, and other packaging requirements was the responsibility of NAVSUP, but all deviations/alterations required FHSO approval.

2. Handling

Handling refers to the provisions built into each container to permit the most efficient manipulation during operation, storage, transportation, and erection. It also includes the materials handling equipment. In general, handling provisions included forklift pockets, corner fittings, skids, dimensions, ratings, and standards that enable a container to be moved, tied down, stored, stacked, erected, and

intermodally manipulated with commonly available and used equipment. It was determined ISO or American Standards Institute (AMSI) standards would be used exclusively unless determined otherwise by FHSO, or the needs of the Defense Transportation System (DTS). FHSO was encouraged to coordinate with NAVSUP or other knowledgeable persons in the DTS to ensure appropriate handling characteristics.

3. Storage

The Fleet Hospitals are intended for storage as final account material for extended periods. Security items, those requiring special storage, and items with a shelf life of less than five years are to be coded as Prepositioned Reserve Material Requirements (PWRMR) for funding and retention as normal Navy Stock Funded items. Since the hospital is designed for three distinct groupings (core, medical support, and base support), storage considerations were to incorporate those functional groupings for ease of breakout. Storage/packaging trade-offs were to also be considered, e.g., a higher level of packaging to permit outside storage, or lower level of packaging where inside storage will be available. Funding was expected to be the key criteria for this type of decision. FHSO was to have overall responsibility for all storage requirements and procedures, and was to use the least-cost option wherever possible.

4. Transportation

Transportation of the Fleet Hospital components to an assembly area would be the responsibility of component contractors. NAVSUP would be responsible for military-owned items, as well as second destination transportation for all items. Once erected, organic transportation would

be the responsibility of base support. FHSO was to be the overall coordinator of transportation methods and schedules. OPNAV was to develop the transportation methodology for wartime requirements.

## J. MANAGEMENT INFORMATION SYSTEM (MIS)

The requirement to manage internal data is organic to all hospitals. It is the flow of management information that will determine the effectiveness of administrative coordination. It includes both the patient information and the supply/maintenance records.

### 1. Requirements Identification

BUMED would have responsibility for determining the requirements for administrative recording of patient medical information. Responsibility for supply data information identification will be shared, BUMED having responsibility for medical equipment and supplies, NAVSUP having facilities components and utilities hardware, and NAVFAC having all others. FHSO would coordinate these efforts.

### 2. Processing Information

BUMED was to have responsibility for recommending the procedures used to accomplish the necessary data flow. Then in the operational mode, medical records would be controlled by the Medical Records Processing Division and the Medical Information Services Division, both of which are in the Patient Affairs Services Division. Supply and maintenance records were to be controlled by the Supply Division for medical equipment and all supplies, and by the Public Works Division for all non-medical equipment. BUMED, in conjunction with the Naval Medical Data Services Center, was to coordinate the development of all data processing systems and procedures, should they be required.

## K. FUNDING

OPNAV 41 retained overall responsibility for the preparation and submission of budget requests. FHSO was tasked to ensure all elements of the FHP were considered in the funding process, and were required to submit a life-cycle cost plan (LCC) addressing developmental, acquisition, PHST, labor, and maintenance costs. Dollar amounts were established for Other Procurement Navy (OPN), Navy Stock Fund (NSF) and Operation and Maintenance, Navy (OM&N) categories. Specific activities were allocated responsibilities for portions of the budget as follows:

| | |
|---|---|
| Program Operations | FHSO |
| Facilities and CESE | NAVFAC |
| Medical Equipment and Supplies | BUMED |
| Utilities | NAVFAC |
| PHST | FHSO |
| Sustained Storage | FHSO |
| Maintenance | FHSO |
| NSF | NAVSUP |
| Personnel | BUMED |

## L. INVENTORY MANAGEMENT

Each hospital was to be assigned a Unit Identification Code (UIC) number. A Coordinated Shorebased Allowance List (COSBAL) would be prepared by Ships Parts Control Center (SPCC) for each hospital based on the table of allowances. The COSBAL would contain the appropriate documentation for inventory control and reporting purposes. The maintenance unit located at each hospital storage site, or preposition site,

would be responsible for unit readiness, reporting directly to FHSO, who has overall inventory management responsibility.

FHSO, assisted by BUMED, NAVFAC, NAVSUP, and the CINC's where feasible, will rotate the assets to meet operational requirements and avoid asset obsolescence while in storage. BUMED procurement funds will be used to replace Fleet Hospital assets in this rotation process.

M. ACQUISITION

In an effort to manage the many staff elements and interfaces involved in acquisition, an Acquisition Management Team (AMT) was formed, composed of the following representatives:

| | |
|---|---|
| Chairman | OPNAV 41 |
| Deputy Chairman | FHSO |
| Facilities Acquisition | NAVFAC |
| Medical Equipment Acquisition | BUMED |
| Medical Equipment Technical Review | BUMED |
| Facilities Equipment Technical Review | NAVFAC |
| Acquisition Logistics | FHSO |
| Programming | OPNAV 41 |
| Budgeting | FHSO |

The FHSO, with the advice and assistance of the AMT, would take action to ensure adequate program and hospital design definition, test and evaluate these designs, arrange necessary contracts, plan and schedule deliveries, and otherwise handle all aspects of the acquisition process.

## N. DESIGN CRITERIA

The design criteria served two purposes. First, they provided the basis from which to judge the alternative designs considered for selection, and second, they provided the criteria to use in modifying the selected system to meet the exacting requirements of a definitive care facility. Not all-inclusive, they did give the necessary shelter design characteristics that were considered most essential.

1. Exterior

   a. Rigid walls, ceilings, floors and doors

   b. Interconnectable

   c. Built-in leveling jacks for both leveling and elevation

   d. Insulated to protect from exterior temperature range of -30° to 120° F

   e. Leakproof and corrosion resistant

   f. Wind load and snow load resistant

   g. ISO configured and movable by standard DOD equipment

   h. Ramps facilitating roll-over entrances

   i. Repairable exterior shell

   j. Easily and quickly erectable

2. Interior

   a. Reflective interior panels

   b. Resistant to scratches, impacts, moisture, wear, stain, chips or effects of environmental changes

   c. Height at least eight feet

   d. Minimal exposed fixtures or apparatus

e. Septically cleanable

f. Floors supportable of required equipment loads

g. Minimal floor interruptions

3. Utilities - Air

a. Forced air for heat and air conditioning

b. 50-55 per cent humidity controlled (DESIGNATED AREAS ONLY)

c. Ducted air distribution (heating six to eight inches off floor, air conditioning 12 to 18 inches from ceiling)

d. No hot/cold spots

e. Positive pressure

f. Back-up units available

g. Standard stock with adaptation

h. Accurate temperature control

i. Filtered air - HEPA (Hospital Environment Filtering Apparatus) 99.9 per cent desired, 80 per cent acceptable

j. No fumes or pollution

k. Minimum 12 room changes per hour (25 desired)

l. Make-up air - at least 20 per cent (variable fresh air)

m. Ventilation must be emergency powered

4. Utilities - Electrical

a. Lighting - 50 to 200 foot candles, with emergency battery pack, variable depending on shelter function

b. Gas scavenger system for anesthesia apparatus in OR's

c. Hospital grade U-ground receptacles

d. Three wire grounded system, in conduits

e. Cluster receptacles, various locations as specified

f. Isolation transformers, located as specified

g. Emergency power automatically commences within ten seconds of normal power loss

h. 120 volts, 60-cycle throughout, except where specified

5. Utilities - General

a. Built-in vacuum, oxygen, $NO_2$, compressed air systems in specified areas

b. Piped potable water to specified areas

c. Central system for sterilization

d. Internal communications as specified

O. MILESTONE TABLES

An exhaustive list was composed of the milestones for the FHP, which included the events, responsible agency, and date by which it was due to be completed. The authors consider the Milestone Table a critical part of the FHP and this paper, and have included it from the October, 1980 ILSMP in its entirety as Table 3.

P. TEST AND EVALUATION

Each hospital procured will be assembled at the packaging and preservation site in CONUS prior to shipment. Presently, the FHSO is involved in testing and evaluating the prototype core facility, along with selected medical support portions. The prototype shelters were procured and modified to accept the specific end items of medical equipment necessary to transform a commercial ISO container into a mobile, definitive care

TABLE 3

FLEET HOSPITAL MILESTONES

| Event | Responsibility | Date |
|---|---|---|
| DETERMINE REQUIREMENTS FOR TECHNICAL MANUALS | | |
| Facilities | NAVFAC | Oct 80 |
| Utilities | NAVFAC | |
| Nonmedical Equipment | ICP | |
| Preposition Equipment | ICP | |
| Medical Equipment | BUMED | |
| PREPARE REQUIRED MANUALS | BUMED/SYSCOM | Feb 82 |
| IDENTIFY FACILITIES REQUIREMENTS | | |
| Core Area | BUMED | Sep 80 |
| Medical Support | BUMED | Jan 81 |
| Base Support | BUMED | Jan 81 |
| SELECT COMPONENT UNITS | | |
| Core Area | BUMED | Sep 80 |
| Medical Support | NUMED | Jan 81 |
| Base Support | BUMED | Jan 81 |
| COORDINATE SHELTER/EQUIPMENT INTERFACE DESIGN | | |
| CONDUCT PREPOSITION SITE SELECTION | FHSO/BUMED NAVSUP/NAVFAC | Jan 81 |
| DETERMINE SITE-PECULIAR UTILIZATION REQUIREMENTS | FHSO/BUMED NAVSUP/NAVFAC | Jan 81 |
| DEVELOP RELOCATION/CONSTRUCTION PLAN | NAVFAC | Oct 81 |
| PROCURE SHELTERS | FHSO | Mar 81 |
| DEVELOP FLEET HOSPITAL PHST CONCEPTS | FHSO | Jul 80 |
| DETERMINE CONTAINER/SHELTER REQUIREMENTS | FHSO | Oct 80 |
| ASSIGN PHST RESPONSIBILITIES | | |
| Packaging | NAVSUP | Oct 80 |
| Storage | NAVSUP | Oct 80 |
| INITIAL TRANSPORTATION | CONTRACTOR | Oct 80 |
| ISSUE PHST FUNDING DIRECTIVES | OPNAV | Oct 80 |
| DEVELOP PHST TECHNICAL MANUAL | NAVSUP | Mar 81 |
| TRANSPORT FLEET HOSPITAL | NAVSUP | Apr 82 |
| MANAGE FLEET HOSPITAL ASSETS | FHSO | |
| IDENTIFY MANAGEMENT INFORMATION REQUIREMENTS | | |
| Medical Records | BUMED | |
| Supply | NAVSUP | |
| Maintenance | NAVFAC | Jan 81 |
| Preposition | FHSO | Jan 82 |

FLEET HOSPITAL MILESTONES (Continued)

| Event | Responsibility | Date |
|---|---|---|
| DEVELOP MANAGEMENT SYSTEM | | |
| Medical Records | BUMED | Jan 81 |
| Supply | NAVSUP/BUMED | Jan 81 |
| Preposition | FHSO | Jan 82 |
| DEVELOP DATA PROCESSING SYSTEMS (Preposition) | FHSO/NAVFAC | Jan 82 |
| DEVELOP DATA PROCESSING SYSTEMS (Fleet Hospital) | BUMED | Jan 82 |
| IDENTIFY MAINTENANCE REQUIREMENTS | | |
| Construction Equipment | NAVFAC | Jun 81 |
| Facilities/Utilities | NAVFAC | Jun 81 |
| Medical Equipment | BUMED | Jan 81 |
| DEVELOP MAINTENANCE MANUALS | | |
| Construction Equipment | NAVFAC | Jun 81 |
| Facilities/Utilities | NAVFAC | Jun 81 |
| Medical Equipment | BUMED | Mar 81 |
| PREPARE PREPOSITION MAINTENANCE PLAN | FHSO | Jul 81 |
| DEVELOP SUPPLY CONCEPTS | FHSO | Jun 80 |
| | BUMED | Jun 80 |
| | NAVFAC | Jun 80 |
| Identify Spares/Repair Parts Requirements | NAVSUP | Oct 80 |
| Allocate Spares/Repair Parts Funds | FHSO | Mar 81 |
| Provision Fleet Hospital | NAVSUP/SPCC | Mar 81 |
| Procure Fleet Hospital Spares/Repair Parts | NAVSUP/FHSO | Mar 81 |
| Procure Long Lead Items | NAVSUP/FHSO | Mar 81 |
| Procure Repairables | NAVSUP/FHSO | Mar 81 |
| Procure Nonshelf-Life Consumables | NAVSUP | |
| Incorporate Spares/Repair Parts into Fleet Hospital System | FHSO/NAVSUP | Mar 81 |
| DEVELOP SUPPORT EQUIPMENT (SE) CONCEPTS | BUMED | Complete |
| DETERMINE SE REQUIREMENT | BUMED | Complete |
| ASSIGN SE INTEGRATION RESPONSIBILITIES | FHSO | Complete |
| DEVELOP SE ALLOWANCE LISTS | FHSO | Complete |
| PROVIDE & ALLOCATE SE FUNDING | FHSO | Complete |
| PROCURE SE | FHSO | Complete |
| DEVELOP PERSONNEL REQUIREMENTS | | |
| Hospital Staff | BUMED | May 80 |
| Preposition Maintenance Staff | BUMED | May 80 |
| Construction/Relocation Crew | NAVFAC | Aug 81 |
| PREPARE CONTINGENCY MOBILIZATION PLAN | BUMED/NAVFAC | Jun 81 |
| ESTABLISH TRAINING REQUIREMENTS | | |
| Medical and Medical Support Staff | BUMED | Jan 81 |
| Base Support Staff | BUMED | Jan 81 |
| Preposition Maintenance Staff | BUMED | Jan 81 |
| Construction/Relocation Crew | NAVFAC | Sep 81 |

FLEET HOSPITAL MILESTONES (Continued)

| Event | Responsibility | Date |
|---|---|---|
| PREPARE OVERALL TRAINING PROGRAM AND PLANS | BUMED | Jan 81 |
| DEVELOP TRAINING FUNDING REQUIREMENTS | BUMED/NAVFAC | Jan 81 |
| CONDUCT CONTINGENCY STAFF TRAINING | BUMED/NAVFAC | Jan 81 |
| REVIEW CONTINGENCY PROGRAM | FHSO | Jan 81 |
| PREPARE LCC PLAN/REPORT | FHSO | Jan 81 |
| PREPARE FUNDING DOCUMENTS | | |
| O&MN | FHSO | Continuing |
| OPN | FHSO | Continuing |
| NSF | FHSO | Continuing |
| ALLOCATE FUNDS | ONPAV/FHSO | Continuing |
| FORM ACQUISITION MANAGEMENT TEAM | OPNAV | Complete |
| ESTABLISH MANAGEMENT OFFICE | CNO | Complete |
| FORMULATE ACQUISITION PLAN | FHSO | Aug 80 |
| INITIATE SHELTER AND EQUIPMENT SELECTION | AMT | Sep 80 |
| FINALIZE SHELTER AND EQUIPMENT SELECTION | AMT | Oct 80 |
| SELECT HOSPITAL P&P SITE | FHSO | Oct 80 |
| PREPARE REQUESTS FOR PROPOSALS | FHSO/BUMED/ NAVFAC | Oct 80 |
| INITIATE CONTRACT DEFINITION COMPLETION | Contracting Agency | Jan 81 |
| SELECT ACQUISITION SOURCE | AMT | Mar 81 |
| SELECT CONUS/PREPOSITION STORAGE SITES | FHSO | Jan 81 |
| AWARD CONTRACTS | Contracting Agency | Apr 81 |
| DEVELOP T&E REQUIREMENTS | BUMED/NAVFAC | Complete |
| PREPARE FLEET HOSPITAL TEMP | FHSO | Complete |
| CONDUCT T&E | FHSO | Jul 80 |
| ANALYZE THE RESULTS | BUMED/NAVFAC | Sep 80 |
| PROVIDE T&E OPERATIONAL FEEDBACK | FHSO/BUMED/ NAVFAC | Nov 80 |

facility. This project took place at Port Hueneme, California, and required an extensive and painstaking effort by Navy Construction Battalion personnel, as well as medical and NAVFAC representatives. The FHSO found itself, with no previous experience, coordinating a myriad of technical construction, engineering, electrical, plumbing, transportation, and medical problems among individuals with virtually no background or understanding of each others' fields of expertise. The FHSO film that documents this operation touches only lightly on the true impact of the situation, but makes it easy enough to correlate their experience to the Biblical account of the building of the Tower of Babel, for in truth, these people all talked a special language.

After completing the necessary modifications and equipment installations, the core facility, or parts of it were transported to the Marine Corps Air Ground Combat Center, Twentynine Palms, California, for desert climate testing in the Summer of 1980. It was subsequently transported to the Marine Corps Mountain Warfare Training Center, Bridgeport, California, in the Winter of 1980-81, for winter weather testing. The results of these tests, as well as a look to the future of the FHP will be covered in the next chapter, Chapter III.

## Q. SUMMARY

The FHP has been a massive undertaking. It may be without parallel in complexity and size as far as BUMED is concerned. There are so many different agencies involved, each with their own special problems. As with all large programs, slippages and cost-overruns are inevitable, and it becomes difficult to maintain sight of the central thread that created

the program initially. There has been a lot of ground-work to keep this program on track, with responsibilities clearly delineated down to user level. This chapter has been devoted to establishing a picture of those responsibilities and to clarifying the key players assigned critical roles in the development of the Navy Fleet Hospital Support System.

## III. ESTABLISHING THE CONTINGENCY MEDICAL SUPPORT REQUIREMENTS

Shortfalls in the United States Navy and Marine Corps medical support capabilities afloat were identified in 1968. As early as 1971, alternative concepts were being proposed to eliminate or reduce these shortfalls, primarily in consideration of building new hospital ships, or converting existing hulls to a dedicated hospital ship role. These alternatives were considered to be too costly at an early date, and were eliminated from serious consideration. In early 1977, the Chief of Naval Operations directed that a feasibility study be conducted of alternatives to dedicated hospital ships (ADHOS), which was to examine all alternatives to a dedicated, full-time hospital ship. Following a logical process, the ADHOS Committee first sought to determine the degree of medical support required by examining potential casualty flow. This process utilized specific planning factors which were: 1) The contingency scenario; 2) The medical support goals; 3) The evacuation policy; 4) The casualty flow; 5) The patient arrival rate; 6) The percentage of surgical patients; and 7) The length of patient stay. Each of these planning factors is addressed as follows:

## A. CONTINGENCY SCENARIO

The Joint Chiefs of Staff (JCS) publish scenarios of possible military conflicts, ranging from limited police action to full-scale, unlimited war. These scenarios not only describe the degree of involvement, but also address geographical locale. The ADHOS selected a contingency scenario reflecting their estimate of the most versatile and plausible range of casualty probabilities. From the Navy perspective, the selected scenario contained both sea-based as well as amphibious assault operations--important considerations for an analysis of normal Navy/Marine situations. [Ref. 7]

## B. THE MEDICAL SUPPORT GOALS

The broad goals of the Navy medical department were listed as the prevention of loss of life and either the full restoration of the individual to health, or the minimization of the resultant disability as a result of injury or disease. The ADHOS study further clarified the following descriptions of care to be expected during combat or contingency operations. [Ref. 8]

### 1. Emergency Care

The medical attention at the site of the occurrence of the injury by whomever is present--usually entailing control of bleeding, splinting, bandaging, pain relief, and evacuation, falls within this category. From the medical support side, this assistance is usually rendered by Navy hospital corpsmen, or the "medic" that appears so often in war movies.

2. Lifesaving Care

Lifesaving care is that medical care designed to reverse or cause the cessation of threat to life, e.g., blood, or intravenous fluid replacement, establishment and preservation of airways, and the removal of dead and decomposing tissue.

3. Definitive Care

Definitive care is defined as any treatment, including surgery, e.g., neurosurgery/thoracic surgery, and other accepted procedures, e.g., physical therapy/administration of disease specific medication to fully restore the patient to health or to minimize the disability that might result from a particular injury. Providing definitive care presupposes a hospital setting with the required specialized diagnostic and therapeutic equipment.

Emergency and lifesaving treatment are covered by Navy hospital corpsmen, either at the site of the injury or illness, or at nearby battle aid stations and aboard ship. However, the definitive care facilities (DCF) do not exist in the Navy medical system as they did during the overt hostilities in the past. It is this lack of DCF's that generated the need for feasibility studies.

## C. EVACUATION POLICY

Planning for overseas conflicts includes assumptions about the proportion of the sick and wounded to be returned to the United States for treatment. These assumptions are expressed as evacuation policy. Evacuation policy is a management tool used to regulate patient buildup and flow through the medical support system during wartime operations.

The JCS determines the evacuation policy for the area of operation. It ranges from 15 to 60 days, and those patients who can be fully treated and returned to duty within the allotted time frame would remain in the COMMZ. Those who are diagnosed as needing treatment in excess of this time frame are medically stabilized and evacuated from the COMMZ as soon as it is possible, to provide more room and access to medical resources for those patients remaining. The ADHOS Committee analyzed the impact of both the 15 and 60 day evacuation policies. Using the information from the extremes, it becomes merely a mathematical manipulation to extrapolate requirements for evacuation policies that fall within this range. [Ref. 9]

## D. CASUALTY FLOW

Casualty flow is defined as the method or pattern by which each individual patient would be routed through the medical support system.

Once becoming wounded in action (WIA), or incurring a disease/non-battle injury (DNBI), the individual would be processed through the medical support system according to the degree of severity of injury or disease. Initial treatment would take place at the site of the injury, and a determination would be made of the next level of care if further treatment is required. Most would be rated through the organic medical stations of the amphibious task force (ATF)/Marine Corps unit, but some could be sent directly to a DCF within the COMMZ. This DCF would probably be Navy, but other branches of the Armed Forces, as well as Host Nations' medical facilities could receive the patient. The patients would remain at the DCF until fully recovered if they are determined returnable to duty within the parameters of the established evacuation policy. If it appears that

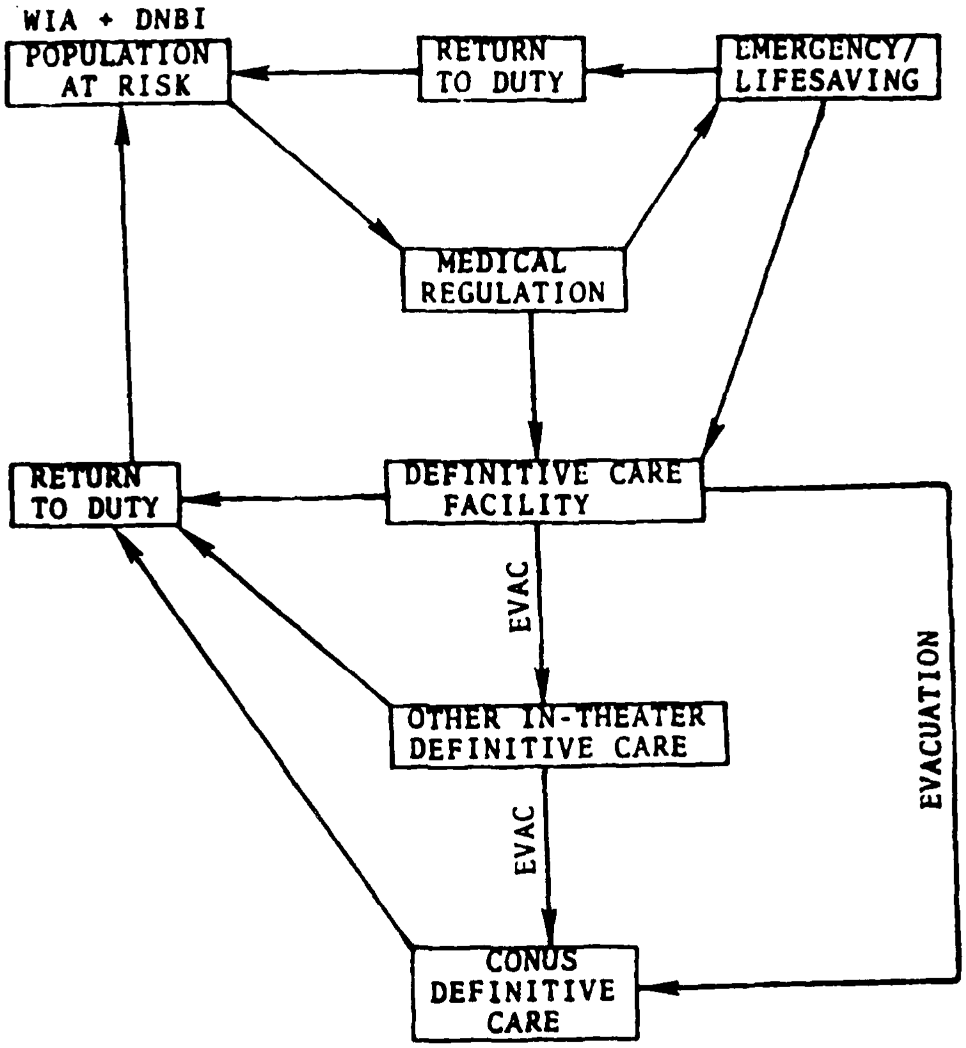
their injuries will take longer to treat than allowed by the evacuation policy, they would be evacuated to the United States, or to other DCF's outside the COMMZ. Patients can be treated and returned to duty at any of these treatment levels/options. Figure 1 depicts this patient flow, taken from the ADHOS report. Figure 1 does not address the disposition of all patients, for some will not survive their injuries or diseases. Deaths are addressed in the facilities requirements, however.

E. PATIENT ARRIVAL RATE

In the contingency scenario selected for planning purposes by the ADHOS Committee, it was assumed that the arrival of patients at the DCF's would be uneven, ranging from 50 to 200 per day within the scope of the scenario. The most probable transport mode would be rotary-wing aircraft, but other intra-theater modes, such as fixed-wing aircraft and surface transport were also anticipated for planning purposes. The geographical area plays a determining role in mode availability and utility. It was acknowledged that patients would arrive day and night. Arrival projections were divided by the 24 hours in a day to simplify the management of the data.

F. SURGICAL PATIENTS

The ADHOS selected scenario further anticipates approximately 60 per cent of the arrivals at the DCF to be surgical patients, with 25 per cent of these requiring the services of a major operating room, and the other 75 per cent needing only a surgical treatment room. Maximum length of delay from the infliction of a wound until surgery was established as eight hours. Major surgery was expected to average four hours per patient,




Patients enter the CASUALTY FLOW from the POPULATION AT RISK and are routed to MEDICAL REGULATION where the severity of their conditions determines the next level of care they will be routed to.

**WIA = WOUNDED IN ACTION**
**DNBI = DISEASE & NONBATTLE INJURY**

FIGURE 1. CASUALTY FLOW

followed by 72 hours in the intensive care unit. The patients treated in the surgical treatment room would only need time to recover from the effects of the anesthesia before being returned to the regular medical wards.

G. LENGTH OF STAY

The expected average length of stay for surgical patients was determined to be eight days with the 15-day evacuation policy, and 25 days with the 60-day evacuation policy. Non-surgical patients would stay seven days under the 15-day evacuation policy, and approximately 12 days with the 60-day policy. The ADHOS Committee also projected 80 per cent of the surgical cases would be evacuated under the 15-day criterion. Under the 60-day evacuation policy, 44 per cent of the surgical cases would be evacuated, and 10 per cent of the non-surgical cases would be evacuated. These figures were used by the ADHOS Committee in establishing the size and composition of any DCF alternative. Based upon such casualty data and their professional judgement, the ADHOS Committee determined the number of operating rooms that would be required to be four, seven and ten--for daily admission rates of 50, 100, and 200, respectively.

The ADHOS study was conducted to determine a long-range solution to the Navy's medical support needs and did not respond to the immediate contingency medical supports requirements. In an attempt to determine the short term contingency requirements, BUMED drafted a Navy Decision Coordinating Paper (NDCP) describing the critical need for a deployable Fleet Hospital Support System. This draft appeared for discussion and coordination in later 1978. The NDCP addressed mainly the European

scenario, due to the high priority the JCS was placing on improving in-theater medical capability. [Ref. 10]

In the NDCP, a computerized mathematical simulation of patient flow throughout the medical support system was used. This model was called the Medical Contingency Planning Model Phase II (MEDCON II), and analyzed data from casualty admissions to the Advanced Base Functional Component (ABFC), Da Nang, Republic of South Viet Nam. The patient statistics utilized for the ADHOS study were derived from experience in the Korean theater. Any discussion of the relevance of past casualty data is problematic. Weapons systems, the environment in which they are used, and the tactics employed change with time, and therefore so do the subsequent casualties. While it is easy enough to argue that both the ADHOS study and the NDCP utilized "cold" data to determine modern-day contingency medical support requirements, they do provide a starting point from which to develop future requirements, and are viewed in that light by the Fleet Hospital Support System planners, rather than as a definitive/exhaustive projection of future reality.

## H. SUMMARY

The key determinant in establishing Fleet Hospital Support requirements is the anticipated casualty severity and the number of casualties in the medical support system flow. This chapter discussed the general methods utilized by both the ADHOS study and the NDCP to generate data to be considered in planning a Fleet Hospital Support System that would be suitable in terms of flexibility and deployability in future wartime scenarios. The next chapter summarizes the various deployable hospital

systems considered by the Fleet Hospital Support System planners, and the key characteristics of each of these configurations.

## IV. ALTERNATIVE MEDICAL SUPPORT SYSTEMS

Five alternative medical support systems were considered by BUMED to determine if any of them (or a combination of two or more) could be used to deliver the surgical and medical care needs of Navy and Fleet Marine Force (FMF) personnel in a modern-day warfare contingency. The five alternative systems considered were: 1) The Advanced Base Functional Component System (ABFC); 2) The Medical Unit, Self-Contained Transportable (MUST); 3) The Marine Corps Environment-Controlled Medical System (MCEMS); 4) The Modular Air Transportable Hospital (MATH); and 5) The New Fleet Hospital Support System. Following is a description of each of these systems.

### A. ADVANCED BASE FUNCTIONAL COMPONENT SYSTEM (ABFC)

The ABFC system identifies facility requirements for support at advanced bases. It includes personnel, material, and equipment needed to deliver surgical and medical care at an advanced base. In the system, as presently designed, ABFCs will not be preassembled and held in stock for issue upon request. Although war reserve requirements for individual ABFCs are specified in the Navy's Support and Mobilization Plans (which have been developed from Fleet Commanders-in-Chief Operation Plans) few ABFC components have been developed beyond the design phase of the ABFC program.

The ABFC system identifies the medical and dental requirements of current operations plans scenarios.

B. MEDICAL UNIT SELF-CONTAINED TRANSPORTABLE (MUST)

The MUST is a modular hardware system which was developed and utilized by the Army, and is designed to provide hospitals for use in combat zones. The MUST modules consist of a series of functional elements separately identified as the power unit and the medical equipment sets (such as surgical; sterile preparation; oral surgery; radiology; clinical laboratory; pharmacy; ward; emergency treatment; patient admission; ear, nose and throat; orthopedic; eye examination and refraction; and supply). The components of each medical equipment set can be shipped in expandable shelters or included in a multipurpose shelter combined with an inflatable shelter.

The entire MUST and associated nonmedical equipment sets are self-sufficient except for fuel and potable water. Construction of expandable and multipurpose shelters is of lightweight materials such as aluminum-faced, foam-filled honeycomb panels. Inflatable shelters are constructed of rubber and fabric with dual walls and inner bladder. A variety of hospital configurations can be assembled to meet the needs of a particular combat area. Following is a description of the units and sets.

1. Power Unit/Utility Pack

The power unit/utility pack is composed of a multifuel gas turbine engine unit that drives 10 and 90 kilowatt, alternating current generators for electrical power. The unit also provides heating, cooling, water pumping, water heating, compressed air, and suction for the MUST modules.

2. <u>Expandable Shelter</u>

The expandable shelter is a rigid-paneled unit which can be unfolded from 100 to 245 square feet for space to be used as an operating room, central material service, laboratory, X-ray, pharmacy, or other similar hospital functional area. The shelter is equipped with ducts for air conditioning, an electrical power distribution system, and provisions for other utility systems. The materials and equipment required for use in each shelter are designed to be packed within the folded shelter during storage and transit.

3. <u>Inflatable Shelter</u>

The inflatable shelter, a dual-walled fabric structure, is formed by air pressure into a shape similar to a Quonset hut. Each shelter has 1,160 square feet of internal floor space and consists of one corridor connector, four 13 foot sections, and two end panels. Standard 13 foot sections are for additional space. The shelter is used for such functions as wards; patient admission; emergency treatment; orthopedics; ear, nose and throat treatment; eye examination and refraction; and medical supply. The shelter is equipped with ducts for air conditioning and for distribution of electricity.

4. <u>Multipurpose Shelter</u>

The multipurpose shelter is a rigid-paneled, metal unit that can be expanded on one side from 84 to 120 square feet and is enclosed by insulated fabric panels. In the nonexpanded mode, it is used as a shipping container for the inflatable shelter and related materials. The shelter can be used as a nurses' station, shower, lavatory, or as a storeroom.

### 5. Auxiliary Equipment and Supplies

Air-lock chambers and corridors protect entrances and passages between hospital components. These are constructed of fabric supported by metal tubing and air-inflated tubes. Fuel, water, food service sanitation, and transportation provisions may be packed and stored with the hospital components, or may be obtained from external sources.

## C. MARINE CORPS ENVIRONMENT-CONTROLLED MEDICAL SYSTEMS (MCEMS)

In May 1977 the Marine Corps established a required capability for an environment-controlled medical system to replace the system of tents and equipment used by field medical units at the time and to provide for physiological stability of casualties in any environment--whether hot, cold, wet, dry, or windy.

Functionally oriented elements of the system require that all equipment be permanently installed, wherever possible, in shelters of the Marine Corps Expeditionary Shelter System (MCESS). These shelters would also serve as shipping containers to permit rapid response to changing tactical, environmental, and geographic situations. Stressed in the design was the maximum use of standard equipment (e.g., heating and cooling units for environmental control, electrical power generators, and water distribution systems). Ground mobility for the system would be provided for by the standard M-127 trailer or one developed in conjunction with the MCESS.

The MCEMS is planned for use by medical companies and the hospital companies of each medical battalion.

1. Operational and Organizational Concepts

The system was planned for compatibility with Marine Corps operational and organizational concepts. Functionally oriented system elements would allow for a building-block concept that would increase flexibility and would enhance task organization of medical support for given operations. However weights and cubes of embarkation loads would have to be increased if this concept were used, and material handling support from other organizations would be required to load and unload the system components. The helicopter transportability requirement imposes a restriction of 10,000 pounds gross weight on individual shelter loads.

2. System Characteristics

Components are housed in a combination of rigid and knockdown shelters of the MDESS. Sample requirements for numbers of shelters per component are listed as follows:

| Component | Rigid | RPCS* |
|---|---|---|
| Surgery | 1 | 1 |
| Intensive Care | 1 | 9 |
| Laboratory/pharmacy | 2 | 1 |
| Central Sterile Room | 1 | 1 |

* Relocatable Panelized Complexible Shelters.

D. MODULAR TRANSPORTABLE HOSPITAL (MATH)

The MATH is a mobile hospital system developed for the Air Force by the Brunswich Corporation. It consists of a 16 bed facility designed for transport by C-130 airlift. It is intended for support of a forward-based air detachment for short periods.

## E. NEW FLEET HOSPITAL SUPPORT CONFIGURATION

As an alternative to the first four systems evaluated (ABFC, MUST, MCEMS, and MATH), BUMED sponsored a feasibility study on configuring a new hospital system that would have greater flexibility in terms of being more adaptable to the Navy's operational requirements. After program objectives were determined, a design for definitive care, self-contained, transportable, and rapidly erectable medical and base support was defined. The Civil Engineering Support Office (CESO), Port Hueneme, California, developed the design as defined by BUMED under the direction and support of the Naval Facilities Engineering Command, Washington, D.C.

CESO's design development plan included recommended transportable hospital shelters and supporting facilities, transportation equipment, utilities, budget estimates, and plans for a site to set-up and test a prototype. More than 50 building and shelter manufacturers were contacted and their products evaluated by CESO in terms of suitability in the Fleet Hospital concept as defined by BUMED. Each manufacturer's system was analyzed concerning the manufacturer's previous experience in the production of International Standardized Organization (ISO) relocatable container-shelters, shipping, erection time, relocatability, and costs. As a result of this evaluation, the following shelter systems were recommended:

(1) ISO 2:1 and 3:1 expandable container-shelters. Pre-equipped units utilizing the shipping containers themselves for the shelter upon arrival at erection destination.

(2) ISO rigid, nonexpandable container-shelters.

(3) Relocatable panelized complexible shelters (RPCS).

(4) Jamesway fabric shelters.

(5) Tent, Extendable Modular Personnel (TEMPER). This tent was developed by the Army Research Laboratory at Natick, Massachusetts.

The medical core area of the hospital (that area of the hospital used for essential functions, excluding non-intensive recovery care) was judged to be most suitably housed in the following type shelters:

| Shelter | Function |
|---|---|
| ISO 2:1 | Laboratory/Blood Bank, Pharmacy |
| ISO 3:1 | Operating Rooms |
| ISO Rigid | Storage |
| RPCS | X-ray<br>Corridors<br>Decontamination<br>Casualty Receiving<br>Operating Room Preparation and Holding Room<br>Intensive Care Units<br>Intensive Care Recovery Room<br>Main Pharmacy |

The medical support and base support areas would be housed mostly in TEMPER fabric shelters or in shelters of similar price and construction.

## F. SUMMARY

This chapter identified and described various alternative medical support systems considered by BUMED, NAVFAC, and CESO before actually building and testing a prototype Fleet Hospital. In the next chapter, the rationale of the Fleet Hospital Support System developers for selecting the system adopted for testing and evaluation is discussed.

## V. RATIONALE FOR ALTERNATIVE SELECTED

A detailed appraisal and study of each of the systems described in Chapter III as alternatives was conducted to determine which system or combination of systems would most optimally fulfill Navy operational readiness, medical support requirements. Factors considered in the evaluation of each system were logistics, technology, utility, flexibility, feasibility of production, storage, transportability, relocatability, and erectability. Following are the evaluations of each system as described by the NDCP. [Ref. 11]

### A. NEW CONFIGURATION

The FHS planners concluded that no single shelter type was sufficient nor suitable for all purposes in the Fleet Hospital. Since the systems examined could not satisfy time restrictions or simply were not designed for (or convertible to) the Navy's requirements, a new configuration for the Fleet Hospital was considered the most feasible of the alternatives available.

The new configuration consists of a mix of shelters. ISO containers (8' x 8' x 20' "boxed") are considered to be ideally suitable for the operating rooms. These expandable ISO containers offer the option of shipping at least part of the surgical suite equipment in the "box" during transit. Upon arrival at its destination it can then be erected and suitably set up with a minimum of time and effort.

The receiving wards, recovery rooms, and intensive care units require large, open spaces for maximum utility. These structures are in the form of knocked-down flat and rapidly erected on site panels.

Since cost considerations precluded the acquisition of containers or panelized structures for the entire hospital, a form of ward-tent was necessary. What was required was not a tent in the traditional sense, but a tent with a lightweight frame that would allow for unobstructed open space inside. The tent should feature high side walls with a greatly reduced slope, windows, rigid door frames, and above all, the tent should have a firm plywood floor to permit the use of gurneys and other wheeled carriages. As noted in Chapter IV, the Army's TEMPER tent was ideally suited for these structures.

Four different sizes of Fleet Hospitals were considered. Sizes are: 250-bed, 500-bed, 750-bed, and 1000-bed. The size utilized at any one time will be determined by the scenario of any particular contingency. Tables four through seven present the predicted packaging, handling, storage, and transportation costs of each size hospital. Each hospital consists of three elements: the medical/surgical core, medical support, and base support. Tables four through seven also break down the predicted costs of each sized hospital by element.

Rationale is provided for the Fleet Hospital planners' choice of a new configuration versus the other existing systems--ABFC, MUST, MCEMS, and the MATH. The new configuration consists of ISO containers, collapsible panels and Army TEMPER tents.

COST OF ONE 250-BED FLEET HOSPITAL ($K)
(FHSO 4/22/80)

| Element | Acquisition | | | | Packaging, Handling, Storage And Transportation (PHST) | | | | Maintenance (Annual) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FAC | MED | PERS | TOTAL | NAVSUP | OPNAV Port Hndl'g | OPNAV Pkg/Crt'g | TOTAL | FAC | MED | OPNAV | PERS | TOTAL |
| CORE | | | | | | | | | | | | | |
| OPN | 4,682 | 925 | 0 | 5,607 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 366 | 1,829 | 0 | 2,165 | 39 | 39 | 500 | 578 | 0 | 0 | 235 | 0 | 235 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 203 | 203 |
| NSF | 50 | 244 | 0 | 294 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 5,068 | 2,998 | 0 | 8,066 | 39 | 39 | 500 | 578 | 0 | 0 | 235 | 203 | 438 |
| MED SUPP | | | | | | | | | | | | | |
| OPN | 2,964 | 132 | 0 | 2,826 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 197 | 466 | 0 | 663 | 18 | 18 | 250 | 286 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 40 | 16 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,931 | 614 | 0 | 3,545 | 18 | 18 | 250 | 286 | 0 | 0 | 0 | 0 | 0 |
| CAMP SUPP | | | | | | | | | | | | | |
| OPN | 1,751 | 0 | 0 | 1,751 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 581 | 0 | 0 | 581 | 18 | 18 | 250 | 286 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 27 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,359 | 0 | 0 | 2,359 | 18 | 18 | 250 | 286 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 10,358 | 3,612 | 0 | 13,970 | 75* | 75 | 1,000 | 1,150 | 0 | 0 | 235 | 203 | 438 |

*Transportation estimate will vary in accordance with destination.

TABLE 4.

COST OF ONE 500-BED FLEET HOSPITAL ($K)
(FHSO 4/22/80)

| Element | Acquisition | | | | Packaging, Handling, Storage And Transportation (PHST) | | | | Maintenance (Annual) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | OPNAV | | | | | | | |
| | FAC | MED | PERS | TOTAL | NAVSUP | Port Hndl'g | Pkg/Crt'g | TOTAL | FAC | MED | OPNAV | PERS | TOTAL |
| CORE | | | | | | | | | | | | | |
| OPN | 6,065 | 1,483 | 0 | 7,548 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 504 | 2,971 | 0 | 3,475 | 45 | 45 | 600 | 690 | 0 | 0 | 322 | 0 | 322 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 279 | 279 |
| NSF | 75 | 397 | 0 | 472 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,644 | 4,851 | 0 | 11,485 | 45 | 45 | 600 | 690 | 0 | 0 | 322 | 279 | 601 |
| MED SUPP | | | | | | | | | | | | | |
| OPN | 4,041 | 260 | 0 | 4,301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 296 | 756 | 0 | 1,052 | 20 | 20 | 300 | 340 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 60 | 25 | 0 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 4,397 | 1,041 | 0 | 5,438 | 20 | 20 | 300 | 340 | 0 | 0 | 0 | 0 | 0 |
| CAMP SUPP | | | | | | | | | | | | | |
| OPN | 2,636 | 0 | 0 | 2,636 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 872 | 0 | 0 | 872 | 20 | 20 | 300 | 340 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 41 | 0 | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 3,549 | 0 | 0 | 3,649 | 20 | 20 | 300 | 340 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 14,591 | 5,892 | 0 | 20,482 | 85* | 85 | 1,200 | 1,370 | 0 | 0 | 322 | 279 | 601 |

*Transportation estimate will vary in accordance with destination.

TABLE 5.

COST OF ONE 750-BED FLEET HOSPITAL ($K)
(FHSO 4/22/80)

| Element | Acquisition | | | | Packaging, Handling, Storage And Transportation (PHST) | | | | Maintenance (Annual) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FAC | MED | PERS | TOTAL | NAVSUP | OPNAV Port Hndl'g | OPNAV Pkg/Crt'g | TOTAL | FAC | MED | OPNAV | PERS | TOTAL |
| CORE | | | | | | | | | | | | | |
| OPN | 9,296 | 2,003 | 0 | 11,299 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 750 | 4,114 | 0 | 4,864 | 50 | 50 | 750 | 850 | 0 | 0 | 380 | 0 | 380 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 344 | 344 |
| NSF | 106 | 549 | 0 | 655 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 10,152 | 6,666 | 0 | 16,818 | 50 | 50 | 750 | 850 | 0 | 0 | 380 | 344 | 724 |
| MED SUPP | | | | | | | | | | | | | |
| OPN | 6,945 | 286 | 0 | 7,231 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 519 | 967 | 0 | 1,486 | 25 | 25 | 375 | 425 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 106 | 34 | 0 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 7,570 | 1,287 | 0 | 8,857 | 25 | 25 | 375 | 425 | 0 | 0 | 0 | 0 | 0 |
| CAMP SUPP | | | | | | | | | | | | | |
| OPN | 4,460 | 0 | 0 | 4,460 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 1,458 | 0 | 0 | 1,458 | 25 | 25 | 375 | 425 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 67 | 0 | 0 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 5,985 | 0 | 0 | 5,985 | 25 | 25 | 375 | 425 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 23,707 | 7,953 | 0 | 31,660 | 100* | 100 | 1,500 | 1,700 | 0 | 0 | 380 | 344 | 724 |

*Transportation estimate will vary in accordance with destination.

TABLE 6.

COST OF ONE 1000-BED FLEET HOSPITAL ($K)
(FHSO 4/22/80)

| Element | Acquisition | | | | Packaging, Handling, Storage And Transportation (PHST) | | | | Maintenance (Annual) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FAC | MED | PERS | TOTAL | NAVSUP | OPNAV Port Hndl'g | OPNAV Pkg/Crt'g | TOTAL | FAC | MED | OPNAV | PERS | TOTAL |
| CORE | | | | | | | | | | | | | |
| OPN | 10,383 | 2,816 | 0 | 13,199 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 852 | 4,767 | 0 | 5,619 | 55 | 50 | 800 | 905 | 0 | 0 | 392 | 0 | 392 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 370 | 370 |
| NSF | 120 | 612 | 0 | 732 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 11,355 | 8,195 | 0 | 19,550 | 55 | 50 | 800 | 905 | 0 | 0 | 392 | 370 | 762 |
| MED SUPP | | | | | | | | | | | | | |
| OPN | 7,893 | 426 | 0 | 8,319 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 590 | 1,047 | 0 | 1,637 | 30 | 25 | 400 | 455 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 120 | 36 | 0 | 156 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 8,603 | 1,509 | 0 | 10,112 | 30 | 25 | 400 | 455 | 0 | 0 | 0 | 0 | 0 |
| CAMP SUPP | | | | | | | | | | | | | |
| OPN | 5,068 | 0 | 0 | 5,068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O&MN | 1,657 | 0 | 0 | 1,657 | 30 | 25 | 400 | 455 | 0 | 0 | 0 | 0 | 0 |
| MPN (Staff) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NSF | 76 | 0 | 0 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,801 | 0 | 0 | 6,801 | 30 | 25 | 400 | 455 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 26,759 | 9,704 | 0 | 36,463 | 115* | 100 | 1,600 | 1,815 | 0 | 0 | 392 | 370 | 762 |

*Transportation estimate will vary in accordance with destination.

TABLE 7.

## B. ADVANCED BASE FUNCTIONAL COMPONENT SYSTEM

All components (medical, dental, and support) in the ABFC system were considered to be outdated, and from a technical standpoint alone, not suited to the proposed system.

The medical and dental components are not intended for rapidly deployable, expeditionary facilities. They are intended to provide modern, clinically acceptable, facilities if adequate lead time is available to procure, transport, and erect the buildings, to install needed equipment, and to deliver supplies. However, the contingency time constraints imposed by current Operation Plans (OPLANS) will not be met by the ABFC system. [Ref. 12] Even if the facilities were procured and held in inventory, the 1000 and 750 bed facilities would require two months for erection by a construction battalion. The entire processes of procurement, assembly, shipping, and construction would require a year or more--hardly satisfactory in meeting modern-day contingency requirements.

## C. MEDICAL UNIT SELF-CONTAINED TRANSPORTABLE

An analysis of the configuration and engineering designs of the shelters in the MUST system demonstrated that they were also inadequate. The program planners considered the problems to be mostly logistics related, and they were summarized in the NDCP as follows:

(1) Most of the existing Navy medical equipment presently operates on 60-Hertz (Hz) power. Although the utility pack of the MUST system will generate a limited amount of 60-Hz power, much of the major medical equipment in the MUST requires 400-Hz power for operation. If the Navy adopted the MUST system, an extensive modification program would be required to convert present Navy medical equipment to the MUST's unique configuration. This undertaking would be unacceptably costly and time consuming.

(2) The operating room was too small.

(3) The uniqueness of the MUST system would result in higher shelter costs.

(4) The expandable shelters did not meet ISO standards which would be critical when airlift capability is restricted and containerships must be relied on for transport.

(5) Although the heating unit delivered heat to each appropriate unit, air distribution within many of the shelters was inadequate.

(6) The overhead areas of some of the shelters was hindered by a large connecting beam and precludes ISO configuration.

(7) Fiberglass coating delaminated at an unacceptably high rate on the outside, interconnecting edges.

(8) Some of the interior materials were inadequate and the connection equipment was not built into the shelters. Therefore, if this equipment were lost in transit, expansion capability would be lost.

## D. MARINE CORPS ENVIRONMENT-CONTROLLED MEDICAL SYSTEMS

The planners field tested the MCEMS shelter systems, and an analysis of the required site preparation and development revealed that this system also was not adequate for the Navy's requirements. The MCEMS shelters were mainly designed to house personnel in the field. Following are some of the major disadvantages that precluded adoption of the MCEM system.

(1) The rigid shelters could not be interconnected as operating manuals indicated.

(2) Interconnection of the RCPS's left gaps between connecting surfaces. This constituted an unsuitable condition for most of the patient treatment areas.

(3) Some of the shelters were not ISO configured.

(4) The overhead area of some shelters was hindered by a large connecting beam and precludes ISO configuration.

(5) Cost of the shelters had risen to the point where a 3:1 ISO container is less costly.

(6) The construction site for these shelters must be relatively level. At some of the field test sites, the ground had to be physically leveled.

(7) As with the MUST system, the heating unit delivered heat to each appropriate unit, but air distribution within many of the shelters was inadequate.

(8) Fiberglass coating delaminated at an unaccepably high rate on the outside interconnecting corners.

(9) Again as with the MUST, the connection equipment was not built into the shelters, and if lost in transit, expansion capability was lost.

## E. MODULAR AIR TRANSPORTABLE HOSPITAL

The MATH shelters are designed for lift by C-130 aircraft, and are not ISO configured. In general, the MATH is designed to be a fly-away medical unit, providing emergency lifesaving care in the absence of other facilities. The MATH system is in no way designed for the provision of definitive care and follow-on treatment. Therefore it is not adequate for the Navy's needs. Since the uniqueness of the design of the MATH system makes it unsuitable for use in a Fleet Hospital, the planners did not give it any further consideration.

## F. SUMMARY

After consideration of various existing deployable hospital systems, the FHS planners concluded that no single shelter type was sufficient or suitable for all purposes in the Fleet Hospital. This was because the systems examined could not satisfy time requirements, or were simply not designed for (or convertible to) the Navy's requirements.

## VI. PRESENT AND POTENTIAL PROBLEMS IN THE FLEET HOSPITAL SUPPORT PROGRAM

The previous chapters have been devoted to establishing the foundation from which the Fleet Hospital Support Program began and are primarily an historical review. This chapter will address problems that the authors consider to be either hampering the FHSP effort now, or with which the program will be confronted in the future.

The casualty flow data were generated, and the decision was made to field semi-standardized hospital core facilities, ranging in capacity from 250-bed to 1000-bed units. The number of units committed during contingencies would be dependent on projections or actual casualties as time allows.

Although the FHS planners considered various configurations for the Fleet Hospitals in the context of differing contingency scenarios, it is impossible to foresee all barriers to the realization of a final product with the flexibility that is necessary to fulfill the Navy's needs. The following paragraphs will address critical present and potential problem areas in the Fleet Hospital Support Program. The authors' efforts in reviewing the alternatives considered were to bring to light some of the advantages, disadvantages and conflicting aspects of the programs considered to date. The authors hope that their consideration of these matters will be of value to future FHS planners towards providing suitable facilities.

## A. OUTPUT

The desired product of the Fleet Hospital Support Program is a transportable, rapidly erectable, technologically advanced, definitive care facility. The long-range plan is to develop a floating DCF, while the short-range plan is to develop a land-based DCF. The floating DCF would be operational upon arrival in waters adjacent to the contingency area. The land-based DCF would be marginally operational within 15 days, and fully operational within 30 days. The land-based DCF also would be adaptable to the floating DCF. [Ref. 13]

## B. METHODS

Alternatives to meet the desired output product were developed and considered. They were dedicated hospital ships (discarded as too costly) and the alternatives to dedicated hospital ships (highlighted in the ADHOS Study and still under consideration by BUMED planners). An additional alternative, hospital aboard barges, is being considered in a separate study, and appears most promising.

The land-based DCF also had a series of alternatives reviewed against the desired output criteria. Although there is yet to be a decision on which floating platform is to be selected, the land-based DCF structures were selected, primarily a combination to meet the differing criteria within the total DCF complex.

## C. RESOURCES

Resources include two major categories, those resources committed to the study and development of the DCF's, and those resources to be committed

when the development phase is completed. These will be addressed separately to avoid confusion.

1. Study and Development Resources

These resources include the personnel committed to developing the concept, those who will test and evaluate it, those who will monitor, and those who provide input and evaluate the results. There are also the fiscal and physical resources involved in this effort.

2. Utilization/Maintenance Resources

Utilization/maintenance resources include all the personnel who will work within the DCF, those who will support it, and those who will be involved in aspects of maintaining it while in a storage state, shipping it, and erecting it. And it also includes the fiscal and physical resources involved in this process.

## D. THE OUTPUT-METHODS-RESOURCE PROCESS IN PERSPECTIVE

The outputs, methods, and resources are not isolated, discrete functions. The desired output determines the feasible alternatives, and the resources determine the acceptable alternative or method for obtaining the output. The Fleet Hospital Program is experiencing problems in each of these areas. Consequently, the milestones presented in Chapter V have slipped significantly, and are presently being rewritten.

## E. THE FINAL PRODUCT--STUDY AND DEVELOPMENT

The responsibilities reviewed in Chapter V have, as a common theme, the development of support and implementation plans for the selected alternative. This presupposed the alternative selected would be

reasonably static by mid-1980. But the selected product, a combination of configurations, has not materialized. The authors were informed this week that costs for the 500-bed hospital equipment had been refigured, and would exceed $8 million, driving the total costs to the point ISO containers would exceed cost constraints, and would only be used for a fraction of the original intent. This heralds further setback in the milestone projections. The authors consider this inevitable in view of some of the criteria used and resources committed at the beginning of the Fleet Hospital Support Program.

1. Definitive Care

The original concept of a definitive care facility may be over-ambitious for the land-based facility, and perhaps even for the floating facility. Both the ADHOS Study and the NDCP highlighted the fact that the majority of casualties would be evacuated. The evacuation time, depending on the JCS time criteria, is expected to range from 15 to 60 days. It is possible the drive to create a definitive care facility exceeds the requirement to support contingency medical needs, and this concept could be downgraded to a philosophy of a surgically intensive facility oriented towards a life-saving stabilization. The probability of returning major surgery patients to duty within 30 days is marginal at best. If the admissions rate approaches the 200 per day level, all of the capability of the Fleet Hospital would be relegated to this role, and the peripheral definitive care applications would be over-ridden by the need to handle the worst cases first.

2. Evacuation Policy

It was the 'JCS evacuation policy' that served as a bench-mark for evaluating the number of beds/operating rooms required, along with the potential admissions rate. Although not privy to the JCS discussions, the authors can project some of the decision criteria used.

a. Host-Nation Facilities

The capability and willingness of host nations in or near the casualty area will be used to the extent available. Host nations facilities, like United States medical facilities, are already overcommitted, but during emergencies, many nations contribute medical personnel and supplies.

b. Other Armed Services

Both the United States and some of its allies maintain military medical facilities, both fixed and mobile. Army and Air Force medical facilities would be analyzed to determine their capacity. Casualties are generally routed to the nearest medical facility, regardless of Service.

c. Line of Communication (LOC)

The geographical location of the contingency will determine the length of the supporting pipeline. Primarily, the flow of assets into a theater of operations is one-way, with very little returning from there to the supporting theater(s). If the travel distance is short (measured in terms of transport time/mode) life-saving and stabilization of casualties may be the only in-theater medical support requirement.

d. Philosophy

In addition to the above considerations, mostly physical, there is the philosophical consideration that goes beyond the physical capacity of casualties returning to duty, or remaining in the COMMZ for recuperation. It is entirely possible that casualties sustaining significant injuries may be evacuated for their convalescence, not only to lessen the load for in-theater medical facilities, but to lessen the psychological impact of having been wounded.

It would appear the more cogent argument is not the JCS determination of evacuation policy that drives the medical support, but rather the medical support available that forces the JCS decision.

3. Environmental Operating Range

A significant operating range of temperatures, -30°F to 120°F, may be not only over-restrictive, but also inadequate. If based on the European scenario, -10°F to 95°F would fit virtually all of the central land mass of Western Europe. If figured on a global scenario, the temperature parameters do not even fit the extremes found in the United States. It is not uncommon for Fairbanks, Alaska to experience weeks when the temperature reaches below -60°F, and the great deserts of the Southwest reportedly exceed 120°F on some of the hotter days. If the intent of the selected temperature ranges are to operate in extreme cold or heat, it may be considerably more economical to either develop separate structures, or to develop hot/cold weather kits for a standard range package.

4. Technologically Advanced

It is a general premise that the more sophisticated and technologically advanced our equipment becomes, the more difficult it is to maintain and repair, the more sensitive it becomes to the environment, and the more precise becomes the power source requirements. While mobility and reliability are not mutually exclusive, they can certainly not be considered complementary, at least not in the case of most of the shelf-type medical machinery being utilized in modern medical facilities. The preliminary test results from Twentynine Palms and Bridgeport, California, the hot and cold test sites, are replete with examples that substantiate the problems that can be expected in the future. While it could be argued that this was expected in the initial test phase of such an extensive project, there are some more telling arguments. [Ref. 14]

a. The medical and support medical equipment were stored for only a relatively short period of time.

b. The equipment was transported an insignificant distance with virtually no inter-modal transfer.

c. Less than half of a 500-bed hospital core medical facility was tested.

d. Comprehensive tests were not conducted under simulated conditions, i.e., around-the-clock, emergency power source.

e. The emphasis during both tests was on efficiency and design, not on speed of erection.

5. Adaptable to Floating Facility

While incorporated into the original design concept, this criterion has no chance of being incorporated. There is no possibility of adapting

the land-based facility to the floating facility by design, because the determination of the floating platform has not been done. It can be predicted, therefore, that the land-based configuration may be the determining factor in the ADHOS alternative selection, at best. In the worst case, it is possible they could be virtually incompatible.

6. Commitment of Resources

It is not an overstatement to suggest that the Fleet Hospital Support Program is the most visible, volatile, and important initiative the Navy Bureau of Medicine has undertaken in the past several decades. It could naturally be expected the resources committed to the FHSP would be monumental, both in dollars and in personnel/effort. While a great deal of effort has been obviously expended, the dollars and personnel do not appear to reinforce such a perception. A review of Chapter V shows the Fleet Hospital Support Office as the central clearing-house and hands-on manager. As a third-echelon command under the cognizance of NAVFAC, they are intimately involved in both the program design and the test of the various facilities/equipment. Additionally, the agencies with which they must communicate are far from the actual project. The communication and coordination requirements are, of themselves, astronomical. At the end of the cold-weather test in Winter 80-81, the FHSO moved from Port Hueneme to Alameda, California. While this move may add to the long-range efficiency of the FHSO, it has disrupted the current test and evaluation process. Virtually no modifications have resulted from the Winter test due to this relocation. The authors consider the staffing of the FHSO far short of what is necessary, even if all the

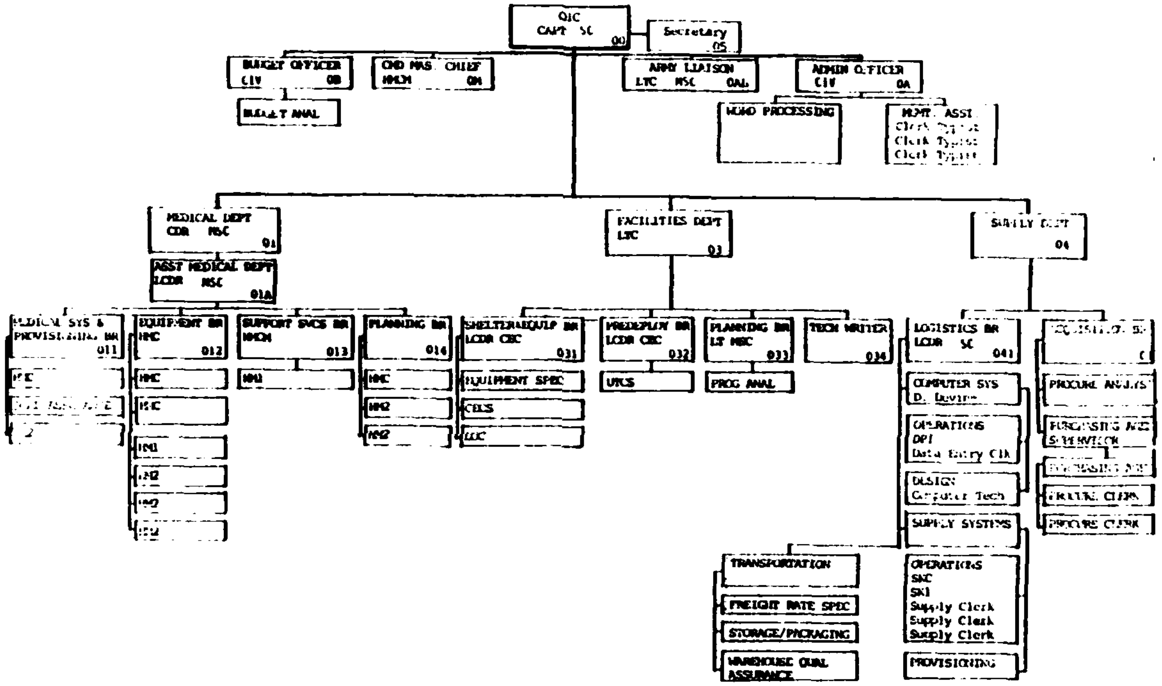
billets were filled. But many of the billets are vacant, and some critical billets were filled since the move to Alameda. A copy of the FHSO structure chart is provided in Figure 2. Funding constraints and the pressure to field the DCF as soon as possible have resulted in incomplete testing, lack of important equipment, and no time to correct shortcomings between the first and second test.

## F. THE FINAL PRODUCT--UTILIZATION/MAINTENANCE

Once the final product is developed and fielded, significant problems will be encountered. Many of these are being addressed now, but if sufficient emphasis is not placed on the future operational employment, there will be no hope of having the land-based DCF functioning in the required time frame. As the final product changes in design, so must the operational support factors/plans. Many of the original plans were based on having a self-contained, ISO-configured core. The recent change to the knock-down structures will have significant impact on virtually every aspect of the PHST, for example.

### 1. Packaging

With self-contained, ISO-configured containers much of the core operating requirement is shipped in protected shelters, reducing the total shipping cube substantially. Those items that are not ISO-configured must be reduced to dimensions sufficient to fit within these containers. And for every reduced configuration, there is a requirement on the other end to reconstruct the item to functional dimension, impacting on the time constraint.




FLEET HOSPITAL SUPPORT OFFICE, ALAMEDA, CALIFORNIA, ORGANIZATION CHART

FIGURE 2.

2. <u>Handling</u>

The more handling required in the process of getting the hospitals from initial construction/production, the more damage will be incurred to the shelters and the medical/support medical equipment. Every item not in a self-contained ship/use container will require multiple handling. This adds to materials handling equipment, space and time requirements.

3. <u>Storage</u>

Unless the hospitals are prepositioned in the theaters where they expect to be utilized, or more specifically, to the exact sites where they will be utilized, they will have to be stored in warehouses, or similar structures. While this does not apply to all the facilities/equipment, it applies to a lot of it. If self-contained shelters are eliminated, the items that are reduced and shipped in containers must be off-loaded at the preposition site, unless the Navy is willing to buy these containers to use as storage assets. If this is the case, it is an expensive type storage, and may lead to re-consideration of the self-contained concept. If this is not the case, more time and effort will be expended getting containers to the preposition storage site, and then loading them. Storage in itself presents a problem. Those hospitals destined for rapid, short-notice utilization will have to be stored in a minimum packaged configuration, which requires constant monitoring during the storage period. This increases the number of personnel necessary to maintain the prepositioned Fleet Hospitals, as well as more room in which to operate. Periodic test and calibration will also require more time and effort, even though virtually every piece of sophisticated equipment will require testing and recalibrating

after shipment to the operational site. It has also been recognized that much of the medical supplies and equipment will not have the necessary shelf-life for prepositioned storage, to include virtually all medications, oxygen, and fuel. This is a separate issue receiving attention at BUMED.

4. Transportation

A 500- or 1000-bed Fleet Hospital is not shipped in 20 or 30 containers, but in hundreds of containers. The oxygen alone is expected to weigh over one million pounds. Such weight makes air deployability unrealistic, forcing consideration of surface transport the only viable alternative, i.e., rail, highway, barge, or containership. Break-bulk shipping can not be considered due to the excessive load/unload time required, and the virtual non-existence of break-bulk shipping ports. The Defense Transportation System is already programmed beyond its capacity for any significant contingency. Idle assets are not available to accommodate the massive shipping requirements of the Fleet Hospitals, and it will take time to divert existing assets from their current operations to the preposition sites. These diversions will be prioritized by JCS-level plans, most of which are set to occur automatically upon notification. Only in a slowly escalating scenario will the medical support facilities fit into the transportation priorities, that is, unless strong political measures are instituted. These authors are intimately familiar with the DTS, and in particular the role of the transportation system in Europe. It is infinitely detailed and programmed, and any unprogrammed requirements of magnitude will create significant blockages to the total system.

5. Erectability

The Naval Construction Force (NCF) received plaudits for their efforts during the tests of the land-based DCF's. Using an entire SEABEE Battalion, they prepared the site in less time than was anticipated, and were extremely responsive to the fluctuating requirements of erecting a complex installation evolving in concept. Some of the lessons learned from these experiences served as warning for the future deployment of the hospitals. It took more site preparation than was originally anticipated, and the success of the erection phase will hinge on the prior hands-on practice of the SEABEES, as well as a definite plan for the positioning and timing of all the facilities by time-phased priority. An excerpt from the 22 Sep 81 letter from NAVFAC to Fleet Hospital Project Office illuminates the problem: [Ref. 15]

> "To erect the hospital in the minimum time and with the optimum expenditure of manpower and equipment it is essential that the erection crews practice erecting units that are the same as those that comprise the hospital...Experience at Twentynine Palms and Bridgeport has shown that careful planning and scheduling of the construction equipment operations is essential...The work area is confined and the size and weight of the components require the use of cranes and rough terrain forklifts...The erection phase must be as finely choreographed as the plays for any professional football team; practice on erection and systems coordination is probably more important than individual skills..."

In addition to the practice and planning for each hospital, the minimum force to erect each hospital is a dedicated SEABEE Battalion. Their arriving at the erection site presupposes they have no other mission, and that there are sufficient SEABEE Battalions, and the necessary equipment in them, to do the ground preparation and erect the facilities. Both of these assumptions are highly suspect.

If it is assumed the erection crews are available, and the land upon which to place the hospitals has been acquired, there remains only the task of erecting them, along with the necessary utilities. This will be a marginal proposition with ISO-configured, self-contained shelters. The authors of this paper are willing to go on record as saying it will not be possible with most of the cargo arriving at the erection site in knock-down shelter configuration to have the core medical facility operational within 15 days of alert notification, or to have the full facility operational within 30 days of notification.

6. Staffing

All of the active duty services, and the reserves, are experiencing problems with acquiring and maintaining specialized medical and support medical personnel. [Ref. 16] All of the Fleet Hospital support concepts hinge on a drawdown/mobilization of Stateside personnel. While this is at present the only short-term source of assets, it will not suffice as a doctrinal concept. The best projections show over 60% of surgical cases being evacuated to these same facilities that are giving up personnel to mobilization roles. BUMED cannot entice sufficient specialized personnel. This is an issue that must be resolved at National level, either through a mobilization designee, or a conscription process.

## G. SUMMARY

The Fleet Hospital concept is viable and necessary. While this chapter has emphasized the problems being encountered, they are intended to illuminate causes, rather than find fault or place blame. What originated as a two-tiered concept, land-based DCF adaptable to the long-range

floating DCF, is beginning to disintegrate from a lack of resources. There are many dedicated servicemembers and civilians dedicating themselves to making this program work, in spite of the obstacles with which they are confronted, but they have too little time, not enough people or money. Chapter VII will address those actions the authors suggest to change the current trend.

## VII. RECOMMENDATIONS

This paper has served to place the Fleet Hospital Support Program in perspective, drawing together pieces of a total concept into one document. But it has also served to illuminate problems being encountered today that can not help but lead to larger problems in the future. There is no doubt that the facilities requirements for a relocatable definitive care facility are not clear. The Fleet Hospital Support concept began as a vision...a vision of a modern, technologically advanced, medical facility capable of being transported to any location in the world where our Servicemembers might require surgically intensive medical treatment. But turning visions into reality is not an easy task. The development, or test and evaluation, of the Fleet Hospital has become a monumental task, far-reaching in scope and impact. If the authors were challenged to make one single recommendation, it would be a recommendation to make this a Department of Defense project, with an intensive research and development effort an essential part. The Fleet Hospital that is eventually fielded should be the prototype for all of our Armed Services. It is the authors' opinions that the Fleet Hospital could be fielded faster,

and would be a much better product if the resources of the Department of Defense were added to those resources the Navy has already committed. The remainder of this chapter lists and explains the series of actions the authors recommend for adoption by the Fleet Hospital Support Program planners to minimize the cost of continuing the program.

## A. FREEZE THE TEST AND EVALUATION PROCESS TEMPORARILY

Significant changes in the current allocation of funds and cost projections for parts of the land-based Fleet Hospital have resulted in recent decisions to modify the core facility, which may jeopardize the ultimate deployability and functional capability of the whole system. Since no substantial modifications have taken place on the shelters following the winter 80/81 test, the impact of a temporary freeze should be negligible. This freeze would be used to accomplish the actions proposed in this chapter.

## B. SELECT THE FLOATING HOSPITAL PLATFORM

An early consideration in the land-based DCF was its adaptability to a floating DCF under the ADHOS concept. The medical equipment, and much of the medical support equipment, will be usable in both the floating and land-based configurations, but without knowing which alternative will be chosen as the floating configuration, substantial additional costs may be incurred. ISO, self-contained shelters would adapt virtually intact to barges, but would not be usable aboard other alternatives, such as converted ships. By not considering adaptability as a significant decision criteria in the land-based DCF design, millions of dollars may be

needlessly expended. Using this argument, it becomes paramount to choose the floating platform before continuing the test and evaluation of land-based shelters.

## C. RE-ESTABLISH LAND-BASED SHELTER CRITERIA

Key variables of the land-based DCF can be viewed as transportability, erectability, usability, reliability, maintainability, adaptability, and cost. Although cost is an important factor, it should not be the key decision criterion to the detriment of the other DCF variables. Chapter VI of this paper contains a discussion of the importance of these issues. Coupled with the hands-on knowledge of the test and evaluation administrators, this chapter could serve to assist in re-evaluating the original Fleet Hospital criteria. A rational approach would be to also prioritize the criteria by degree of importance, and base trade-off decisions on such a matrix.

## D. TECHNOLOGY TRANSFER

Part of the difficulty in the modification of the tested shelters has been the lack of expertise on the ultimate use of the shelters and associated medical equipment by the personnel doing the modifications. The users, in this case medical, medical support, and specialized maintenance personnel, should play an integral role in this process. M. E. Essoglou suggests the positive aspect 'linker' personnel add to product acceptability/credibility when used as intermediaries between 'knowledge suppliers' and 'knowledge users.' [Ref. 17] Although he is discussing technology transfer in the context of Research and Development, the point

has validity in the Fleet Hospital Support Program. The test reports from Twentynine Palms and Bridgeport indicate many shortcomings that might have been avoided had physicians, nurses and medical maintenance technicians been present during the alteration phase. While there was no single problem of significance, the combination of many small problems noted in the test results presages an extensive modification effort. The use of technology transfer fundamentals and user personnel in 'linker' roles would have saved much of this effort, not to mention time and money.

## E. FUNDING

Resource allocation, particularly personnel resources, should be reviewed acknowledging the criticality of the test and evaluation phase of the Fleet Hospital Support Program. Shortfalls in subject areas as well as in total manpower dedicated to the 'development stage' appear far short of the requirements. If insufficient money is apportioned early, there will be problems in each of the subsequent hospitals delivered to the field for use. The prototype configuration tested at Twentynine Palms was tested at Bridgeport before many modifications could take place, and the test results are replete with the comment 'same as at Twentynine Palms,' or words to that effect. The Navy is saving millions of dollars by going directly to test and evaluation without the benefit of Research and Development. The lack of funding may make this more expensive in the long run. A few beds that arrive when needed seems infinitely more worthwhile than thousands of beds arriving too late.

## F. CRITICAL PATH METHOD OF PROJECT DESIGN

The critical path method is a technique used by program managers to sequence events in a project according to the order in which they must be accomplished, and attributing the expected process time to each of the events. It assumes certain events must be completed before others can begin. When all events are charted according to their necessary sequence, the longest consecutive chain of events is used to describe the 'critical path.' [Ref. 18] If the milestone table for the Fleet Hospital Support Program is redeveloped using the Critical Path Mathod, it would serve to emphasize the order in which events must occur and provide a more reliable estimate of when the Fleet Hospitals can be expected for utilization.

## G. RESUMPTION OF TEST AND EVALUATION

Once those items presented in paragraph B through F (above) have been completed, the test and evaluation phase should continue, targeted at early identification of the core configuration of the land-based DCF. This core configuration should remain stable to the maximum possible extent, for most of the program is dedicated to plans supporting the core of the DCF.

## H. CONCLUSION

The Fleet Hospital Support Program originated in response to a serious shortfall in the Navy's ability to meet its primary medical support mission. Unless substantial alterations in the present thrust of the program are made, it is highly improbable the land-based DCF portion will meet its intended operational purpose. The efforts and resources already

expended have not been wasted, but without reorientation/revitalization they will fall far short of their potential. The authors hope this paper can serve not only as an objective view of the pieces of the Fleet Hospital Support Program, but also as a tool to assist in making it more effective.

## LIST OF REFERENCES


1. Joint Chiefs of Staff (JCS) Publication 3, Volume 1, Chapter 4, JCS Publication Date July, 1975.

2. "U. S. Medical Capability 'Inadequate' for Combat," Monterey Peninsula Herald, November 4, 1981.

3. Defense Resources Management Study, Final Report, Chapter V, "Military Health Care," U. S. Government Printing Office, 1979.

4. "We Need a Single, Unified Military Medical Department," LCDR John L. Kubal, MSC, USN, Marine Corps Gazette, Volume 63, Number 10, October 1969.

5. "In Case of War," Monterey Peninsula Herald, April 17, 1981.

6. Navy Decision Coordination Paper, Fleet Hospital Program, prepared by Fleet Hospital Support Office, Port Hueneme, California, May 30, 1980.

7. Final Report of the Feasibility Study of Alternatives to Dedicated Hospital Ships (ADHOS), Department of the Navy, Office of the Chief of Naval Operations, Washington, DC, 27 February 1978.

8. Ibid.

9. JCS Publication 3, Volume 1, Chapter 4.

10. Navy Decision Coordinating Paper.

11. Ibid.

12. Joint Chiefs of Staff, Contingency Operation Plans 4102 and 5027, contained in "Medical Capability to Support Approved War Plans," a tri-service study conducted by the JCS, Government Printing Office, 1977.

13. ADHOS Study.

14. Fleet Hospital Evaluation, Twentynine Palms/Bridgeport Results, prepared by the Fleet Hospital Support Office, Port Hueneme, California, June 1981.

15. Commander, Naval Facilities Engineering Command, letter to Fleet Hospital Project Office, (PM-24), Training for the Erection of the Fleet Hospital, 22 September 1981.

16. Report to the Congress by the Comptroller General of the United States, HRD-81-67, Government Printing Office, June 24, 1981.

17. "Linker Role in the Technology Transfer Process," M. E. Essoglou, Technology Transfer in Research and Development, edited by J. A. Jolly and J. W. Creighton, Naval Postgraduate School, Monterey, California, 1975.

18. Fundamentals of Management Science, Efrain Turban and Jack R. Meridith, Irwin Dorsey Limited, Georgetown, Ontario, 1981.

## INITIAL DISTRIBUTION LIST

| | | No. Copies |
|---|---|---|
| 1. | Library, Code 0142<br>Naval Postgraduate School<br>Monterey, California 93940 | 2 |
| 2. | CAPT Everett L. Jones, SC, USN<br>Commanding Officer<br>Fleet Hospital Support Office<br>Building 5<br>620 Central Avenue<br>Alameda, California 94501 | 1 |
| 3. | CDR Stanley Tenopuir, MSC, USN<br>Fleet Hospital Support Office<br>Building 5<br>620 Central Avenue<br>Alameda, California 94501 | 1 |
| 4. | LCDR David R. Gervaia, MSC, USN<br>Fleet Hospital Support Office<br>Building 5<br>620 Central Avenue<br>Alameda, California 94501 | 1 |
| 5. | Mr. Milou E. Essoglou<br>Naval Facilities Engineering Command<br>Department of the Navy<br>200 Stovall Street<br>Alexandria, Virginia 22232 | 2 |
| 6. | Dr. Richard S. Elster, Code 54Ea<br>Department of Administrative Sciences<br>Naval Postgraduate School<br>Monterey, California 93940 | 2 |
| 7. | Dr. J. W. Creighton, Code 54Cf<br>Department of Administrative Sciences<br>Naval Postgraduate School<br>Monterey, California 93940 | 10 |

8. MAJ John K. Selfe, USA 1
582-D Michelson Road
Monterey, California 93940

9. LT Gary L. Rupp, MSC, USN 1
Code 12
Bureau of Medicine and Surgery
Department of the Navy
Washington, DC 20372

10. Defense Technical Information Center 2
Cameron Station
Alexandria, Virginia 22314

DATE
ILME
— 8